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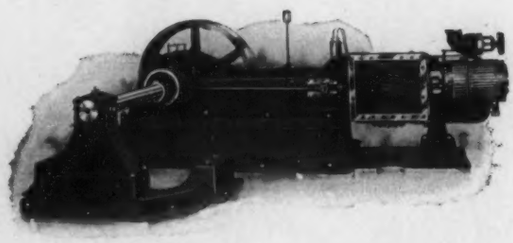

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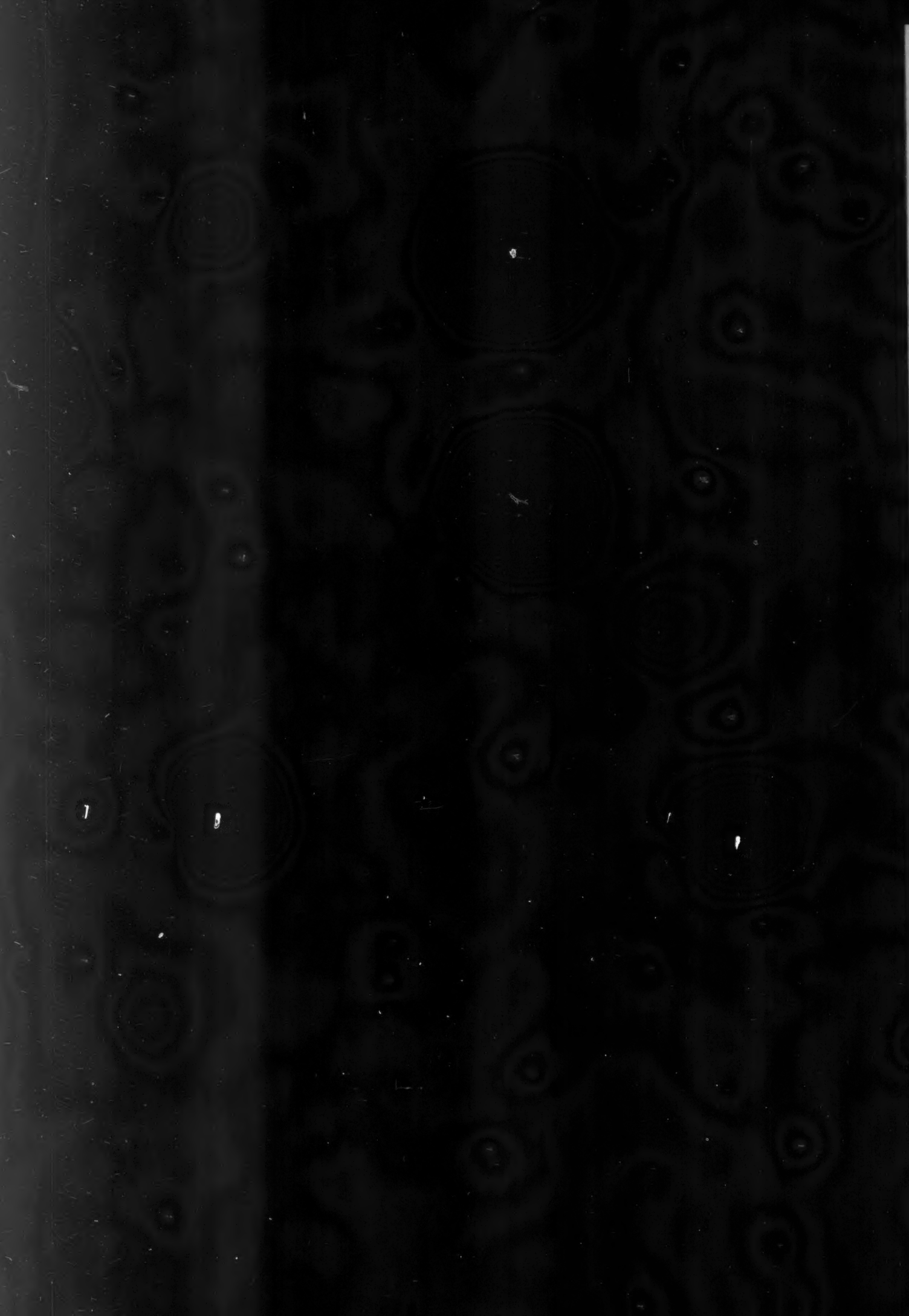

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POWER AND GAS
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THE EMERGENCY SERVICE OF THE LOS ANGELES GAS AND ELECTRIC CORPORATION[1]

BY C. S. VANCE.

One of the most serious as well as difficult problems confronting gas companies operating in large cities today is the necessity for rapid and efficient handling of emergency work. It is of the utmost importance that a complaint of leaking gas be responded to with all possible speed, for what may at one moment be merely a serious leak, and easily remedied if attended to in time, may become a disastrous explosion within the instant. On the one hand is a condition which, if promptly rectified, is without serious result, while on the other, even a slight delay might result in damage to property or even loss of life, the extent of which may not be estimated.

Emergency Automobile, Los Angeles Gas and Electric Corporation

The practical efficiency of the emergency department is therefore largely determined by the promptness with which it responds to the call. With this in view, the writer was early attracted by the advantages of the automobile for such service on account of its

[1]Paper read before Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

speed and equipment carrying capacity, and on June 13, 1908, a regular five passenger, 30 h. p., touring car was adapted to the purpose by removing the tonneau and constructing in its place, as a component part of the body of the machine, an oblong box with hinged lids opening upward from either side. Within this compartment is arranged for immediate use the following equipment: 1 10-inch Trimo wrench, 2 14-inch Trimo wrenches, 1 18-inch Trimo wrench, 1 24-inch Trimo wrench, I pr. pipe cutters, 1 pr. 10-inch gas pliers, 1 cold chisel, 1 claw hammer, 1 2-lb. calking hammer, 1 set calking tools, 1 hacksaw, 1 monkey wrench, 1 8-inch screw driver, 1 crow bar, 1 axe, 2 picks, 2 shovels, 1 handsaw, 1 pr. easy bolt cutters, 1 100 ft. rope, 1 hand line, 2 tackle lines, 2 pr. climbers, 2 belts, 2 pr. rubber gloves, 2 pr. connecters, 1 pr. lineman's pliers, 1 lineman's knife, 1 smoke jacket, 1 anti-asphyxiator, 1 medical case, 1 3-gal. fire extinguisher, 1 oxygen tank charged with 50 gallons of oxygen, 2 5 ft. ladders, extension. A regular inspection of the tools and appliances is made to see that they are in serviceable condition and to prevent any depletion of the equipment.

The regular station of the automobile is in the rear of the main office building, in the business section of the city, and a crew of four uniformed men are on duty at all hours of the day and night, Sundays and holidays included, to respond to emergency calls. Except in unusual cases a call is responded to by only two men, one of whom acts as chaffeur, and both of whom are men of experience and training in this class of work.

Practically all of the calls come through the medium of the telephone and are received by what is known as the investigation department. In this department only the most reliable and accurate men are employed, experience having shown that carelessness in the receipt and recording of such information is fraught with great danger. They are especially drilled in the importance of securing full details as to the nature of the trouble, its location, etc. For this purpose a special form of order, printed in red, is used in the case of gas leaks, and all employees have the most positive instructions to give such orders precedence over all other work. These orders provide for the name and address of the consumer or party reporting the leak, location of leak, time received by the investigation department, the time of delivery to the emergency men and the time of their arrival at and departure from the place of trouble.

Immediately upon receipt of complaint of leaking gas, the telephone operator calls the emergency crew into action by means of an electric signal, and by the time the order is written the automobile is cranked and ready for the start. This has been accomplished within one minute from the time telephonic communication is established between the office and the party reporting the leak. By test calls, the automobile has, within five minutes from the time of notification at the office, covered a distance of over two miles.

Arriving at the site of the trouble, the man in charge of the crew locates the party telephoning the complaint and ascertains the cause. If it is from leaky fixtures or appliances the necessary remedy is quickly applied and the crew returns to the station, first communicating with the office by telephone to ascertain if any more emergency orders have been received.

If the call should be at night, however, and the trouble found to be too serious for the regular crew to rectify, the driver of the car, who is furnished with a book containing the names of the corporation's employees, quickly collects additional help from among those residing in the vicinity.

Two motorcycles equipped with kits of tools are held in reserve at the emergency station for use in the event of a serious leak call coming in while the auto is out. Should the car be out of commission for any length of time, one of the corporation's several passenger automobiles is called in temporarily for the emergency service.

In addition to leak, accident, and other calls of a serious nature, the automobile responds to all fires within a radius of two and one-half miles, and elsewhere throughout the city in case of a general alarm.

This service is a valuable adjunct to the city fire department in promptly shutting off the gas supply in burning buildings and cutting live electric wires that so frequently menace the lives of firemen. In many instances the emergency automobile has arrived at fires in advance of the fire apparatus, and several cases are recorded where the crew has extinguished fires before the arrival of the fire department.

In recognition of the value of this apparatus to the public, the Los Angeles city council, in a traffic ordinance recently enacted, gives it the same exemption from speed limitations as is allowed fire and police patrol apparatus.

Gas asphyxiation is another field of utility for the automobile emergency service. In several instances life has been saved through the prompt administration of the oxygen carried as part of the car's regular equipment. This feature is of great value to the corporation's own employees, since it is no uncommon occurrence for men to be overcome by gas in street main construction work at remote locations where medical attention is not readily obtainable.

A complete book record is kept of every call responded to by the automobile, with a description of the nature of the trouble and the remedy applied. Since the date of its installation on June 13, 1908, to the corresponding period of this year, the emergency automobile has responded to 1,092 calls, 868 of which were gas leaks, segregated as follows: 32 broken services under houses, account moving houses, etc.; 11 broken services in streets, account grading; 61 broken fixtures in houses, caused by moving furniture, etc.; 754 leaks at meters, connections, stoves, heaters, etc.; 150 fire calls; 34 electric calls on account of poles on fire, wires down, etc. During this period a total of 4,169 miles was run, with a consumption of 514 gallons of gasolene.

Not only have the corporation's interests been safeguarded by this service, but the protection which it affords to the public is of inestimable value, providing as it does a means of promptly rectifying at any hour defects in or disarrangements of the consumer's house-piping, over which gas companies do not ordinarily exercise control. This is amply demonstrated by the fact that since its inauguration not one serious case of explosion due to illuminating gas has occurred within the great area with its 350,000 inhabitants supplied by this corporation.

ELECTRICALLY HEATED HOUSEHOLD APPLIANCES.[1]

BY A. G. JONES

The load curve of the average distributing station usually presents an appearance resembling the profile of the Rocky Mountains, the valleys representing the average load for twenty-four hours, and the highest peaks representing the maximum load for short intervals, at which time the generating apparatus is taxed to its utmost. If we average the "altitudes" of the peaks and the valleys, and divide this value by the maximum power demanded during a certain period of 24 hours, we obtain what is called the "load factor." Sometimes the load factor is defined as being the ratio of the average load during a given period of time to the normal capacity of the station.

The load factor of the central station is a subject which materially affects the financial success of the station. Therefore, progressive managers throughout the entire country have turned their attentions toward making the ratio above referred to as high as possible. The cost of managing the system and distributing the electrical energy is not merely the operating expense of the station but includes the depreciation on the equipment and interest on the money invested. The operating expense may be divided into two classes, one class dependent on the load, and the other class independent of the load. It is, therefore, evident that a station with a large kilowatt output will have a cheaper operating cost per kilowatt hour than will a similar station of smaller kilowatt hour output. It has been found by experience that it is almost as economical from an operating standpoint to deliver two kilowatt hours as it is to deliver one kilowatt hour, assuming, of course, that the plant is of sufficient capacity to take care of the large load. It will, therefore, be seen that a high load factor, meaning a high kilowatt output, would considerably lower the cost of operation of a given station. Medium and large size stations consider a load factor of 35 per cent to be very good, indeed, and a load factor of 50 per cent to be excellent.

Of course, to increase the load factor, it is necessary to fill in the "valleys" above referred to, and in the case of stations, the majority of whose load is a lighting load, can best accomplish this result by securing a daylight load. In the great West, it seems that, due to the rapid growth of the population and the increased demand for power in connection with mining and milling plants, the central station manager has confined his efforts almost entirely to the expansion of the distributing system, and in a number of cases the load factor has received scarcely any attention. The time, however, has come when due to the large amount of generating machinery installed, it is absolutely necessary to improve the load factor in order that the generating and distributing may be carried on in the most profitable manner.

The daylight load is secured by the installation of motors and heating devices. How many central managers are there who walk down their brilliantly lighted thoroughfares in a blaze of light from electric signs, which have been placed on the system by the strenuous efforts of solicitors? The electric sign business is undoubtedly profitable to the central stations, but if you will stop a moment and consider the effect which would be obtained if electric signs were in use during the morning, the noon and the evening meal hours, you will find an incentive in instituting a vigorous campaign in behalf of electrically heated devices. In other words, suppose that you had an equivalent connected load of heating devices in service during the morning, noon and evening meal hours, do you not agree that the load factor would be materially improved, and the cost of generation per kilowatt hour materially reduced? The experience of companies that have extensively exploited electric heating devices will confirm the truth of such arguments. Think of the energy lost while operating a large generating plant at the reduced efficiency ensuing from a small load. Suppose that the central station in which you are interested had connected to its lines fifty or one hundred cooking outfits, such as are shown in the illustration, and that the average loads of such outfits were represented by the values given in the above table.

COOKING AND HEATING DEVICES.

	Breakfast 6:30 - 8:00	Baking 8:00 - 11:00	Ironing 7:00 - 11:00	Dinner 11:30 - 1:00	Misc. Day	Supper 4:30 - 8:00	Misc. Night	Total
Monday	¾ kw.h.	1 kw.h.	0 kw.h.	1½ kw.h.	¼ kw.h.	½ kw.h.	0 kw.h.	4 kw.h.
Tuesday ...1	kw.h.	0 kw.h.	2½ kw.h.	1½ kw.h.	½ kw.h.	1 kw.h.	½ kw.h.	7 kw.h.
Wednesday.	¾ kw.h.	3 kw.h.	0 kw.h.	¾ kw.h.	0 kw.h.	½ kw.h.	0 kw.h.	5 kw.h.
Thursday ..	¾ kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	¼ kw.h.	0 kw.h.	0 kw.h.	2 kw.h.
Friday 1	kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	0 kw.h.	½ kw.h.	½ kw.h.	3 kw.h.
Saturday ..	¾ kw.h.	3 kw.h.	0 kw.h.	¾ kw.h.	1 kw.h.	½ kw.h.	0 kw.h.	6 kw.h.
Sunday	½ kw.h.	0 kw.h.	0 kw.h.	2½ kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	4 kw.h.
Total ..5	½ kw.h.	7 kw.h.	2½ kw.h.	9 kw.h.	2 kw.h.	3 kw.h.	2 kw.h.	31 kw.h.

LIGHTING LOAD.

Monday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	½ kw.h.	1½ kw.h.
Tuesday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	¾ kw.h.	¼ kw.h.	1 kw.h.
Wednesday...0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	½ kw.h.	1½ kw.h.
Thursday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	1 kw.h.	1 kw.h.	2 kw.h.
Friday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	¾ kw.h.	¼ kw.h.	1 kw.h.
Saturday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	.1 kw.h.	½ kw.h.	1½ kw.h.
Sunday 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	¾ kw.h.	¾ kw.h.	1½ kw.h.
Total 0	kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	0 kw.h.	6¼ kw.h.	3¾ kw.h.	10 kw.h.

Then notice the contrast with the table representing an average lighting load.

I wish to call your particular attention to the flat iron load above enumerated, and to the advantageous time during which it is in service.

The above values were taken from actual experience and may be considered as being a fair average for a family consisting of three or four persons. In the particular case above referred to, the consumer used current during the previous year to the amount of $35.00 for light, and after the installation of the heating and cooking devices, his bill was increased to approximately $110.00 per year, showing an increased income to the central station amounting to about 200 per cent for this particular residence. This case illustrates what can be done, and what should be done, in exploiting the electric heating business. Notwithstanding the great increase in revenue to the central station, the

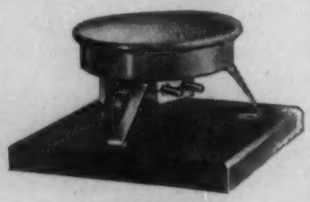
[1]Paper read at Joint Convention N. W. Electric Light and Power Association and Seattle Section A. I. E. E., Seattle, September 7, 8, 9, 1909.

consumer's bill was approximately the same as it had previously been when using gas and coal for cooking purposes.

In introducing heating and cooking devices, public demonstrations are of great value, but under no condition should the demonstration be in the hands of a person incompetent and unfamiliar with the details of the devices. A great amount of interest is always shown in displays and demonstrations of electric heating and cooking devices. Besides the attractive appearance of the goods they seem to have a fascination which cannot be easily explained. They are clean, sanitary, quick in operation, and ornamental, reasons which undoubtedly appeal to the most critical housewife.

The layman usually has a more or less vague idea as to the meaning of the watts rating as will be found on the name plate of heating devices, and, perhaps, the simplest way to make such a rating comprehensive to the public is to reduce the rating in watts to an equivalent number of 16 c. p., 110 volt, carbon lamps. The standard 110 volt, 16 c. p. carbon lamp consumes about 56 watts, therefore, if the watt rating on the name plate of the heating device be divided by 56, the "lamp equivalent" will be obtained. If the consumer will, therefore, compare the lamp equivalent of the heating device which he proposes to use, he will have a very good general idea of what he might expect the operation of the heating device will cost, by comparison, with previous lighting bills. If electric cooking and heating is employed extensively in any given house, it is desirable to have the entire circuit separate from the lighting circuit, and metered by an independent meter. In this way the consumer can obtain definite figures as to the actual cost of cooking or heating by electricity. Often the installing of a curve drawing watt meter for a short time will prove instructive both to the customer and the lighting company.

Radiant Toaster



Small Disc Stove

The importance of heating device displays in the exhibit rooms or offices of central stations will not be questioned by the most skeptical manager, and in order that such a display may be most effective and interesting to prospective customers, the articles chosen should be representative and few in quantity, rather than simply a miscellaneous collection of a complete line. To be most attractive, they should be surrounded by articles in keeping with their use. For instance, a chafing dish on a well finished table with a few dainty dishes and some silverware will catch the eye of an apparently disinterested person much quicker than would a general conglomeration of heating devices. The coffee percolator and the toaster, when in operation, make a very attractive display. In other words, the more ornamental the appearance of the general display, the more effective it will be.

A very attractive method of introducing flat irons and other of the most popular heating and cooking devices is to let the consumer have a flat iron or toaster for several days or a week, and if they use them at all, the chances are they will be retained, and as pointed out before, a factor of prime importance is that a salesman or demonstrator should be thoroughly familiar with the material which he is handling. After familiarizing himself with the details of construction and design, it will be found beneficial if he will post himself regarding the elementary theory of the conduction, convection and radiation of heat, a very comprehensive idea of which can be gained from any standard text book on the subject.

The heating units in various electric appliances vary materially with different manufacturers and with the particular article in question. The units may, however, be divided into three general classes known as:

First, flat unit.

Second, the well known cartridge unit, and

Third, A unit composed of resistance wire wound on mandrels of various shapes.

Cigar Lighter

Water Heater

A typical flat unit consists of a stamping of the desired shape made from a solid sheet of specially prepared resistance metal of very thin cross section. This is placed between thin sheets of amber mica, and securely clamped in position, which brings the resistance material in close thermal contact with the surface to be heated. Such a unit is ideal for flat irons, percolators, small disk stoves, and other appliances where an even temperature is required over the entire surface.

The cartridge unit consists of a spiral of suitable resistance wire wound on edge, each layer being insulated by a powdered material resembling porcelain. The spiral is then encased in a metal cartridge, after which it is baked to a very high temperature. This type of unit is eminently well suited for instantaneous water heaters, and other devices which do not require uniform heating of a flat surface. The cartridge unit is also used with great success in flat irons, since the metal composing the iron can be shaped in such a manner as to produce an even temperature on the smoothing surface of the iron. This is accomplished by putting a great amount of metal in the proper place, and also by forming an air space directly beneath the cartridge unit, that is, between the unit and the surface of the iron, thus preventing the center of the iron from becoming too hot and insuring a uniform heat on the working surface. The cartridge unit has the advantage of being very easily renewable, and also has a remarkably long life.

The various heating units constructed from ordinary round resistance wire wound on suitable mandrels have many applications, but broadly speaking do not admit of the most efficient utilization of heat.

Great care should be exercised by the agent or solicitor in selling heating devices to be certain as to the voltage of the circuit upon which the device is to be used. A large percentage of the trouble with heating devices is due to using such devices on circuits of voltages varying widely from that for which the unit is designed. In order to get the maximum efficiency from a heating unit, it must be designed rather closely to its voltage limit, and for this reason heating devices should not be used on circuits varying more than 5 per cent from the rated name plate voltage. An excessive voltage, of course, results in short life, and low voltage results in dissatisfaction caused by the great length of time taken for the unit to come to a working temperature.

The application of heating and cooking devices is very broad. The table given below, being taken from the Solicitor's Handbook of the National Electric Light Association, gives a very complete outline of the most useful devices. The table gives the name of the material, the energy consumed and the cost of operation per hour at a rate of 5c per kilowatt hour:

Apparatus.	Watts.	Cents per Hour.
Broilers, 3 ht.	300 to 1200	1.5 to 6
Chafing dishes, 3 ht.	200 to 500	1 to 2.5
Cigar lighters	75	0.375
Coffee percolators for 6-in. stove.	100 to 440	0.5 to 2.2
Coil heaters	110 to 440	0.5 to 2.2
Corn poppers	300	1.5
Curling-iron heaters	60	0.3
Double boilers for 6-in., 3 ht. stove.	100 to 440	0.5 to 2.2
Flatiron (domestic size), 3 lb.	275	1
Flatiron (domestic size), 4 lb.	350	1.4
Flatiron (domestic size), 5 lb.	400	2
Flatiron (domestic size), 6 lb.	475	2.4
Flatiron (domestic size), 7.5 lb.	540	2.7
Flatiron (domestic size), 9 lb.	610	3.05
Foot warmers	50 to 400	0.25 to 2
Frying kettles, 8 in. diameter.	825	4.125
Griddle-cake cookers, 9" by 12", 3 ht.	330 to 880	1.7 to 4.4
Griddle-cake cookers, 12" by 18", 3 ht.	500 to 1500	2.5 to 7.5
Heating pads	50	0.25
Instantaneous flow water heaters.	2000	10
Kitchenettes (complete), average.	1500	7.5
Nursery milk warmers.	450	2.25
Ornamental stoves	250 to 500	1.25 to 2.5
Ovens	1200 to 1500	6 to 7.5
Plate warmers	300	1.5
Radiators	700 to 6000	3.5 to 30
Ranges: three heats, 4 to 6 people.	1000 to 4515	5 to 22
Ranges: three heats, 6 to 12 people.	1100 to 5250	5.5 to 26
Ranges: three heats, 12 to 20 people.	2000 to 7200	10 to 36
Shaving mugs	150 to	.75
Stoves (plain), 4.5 in., 3 ht.	50 to 220	0.25 to 1.1
Stoves (plain), 6 in., 3 ht.	100 to 440	0.5 to 2.2
Stoves (plain), 7 in., 3 ht.	120 to 600	0.6 to 3
Stoves (plain), 8 in., 3 ht.	165 to 825	0.75 to 4.125
Stoves (plain), 10 in., 3 ht.	275 to 1100	1.3 to 5.5
Stoves (plain), 12 in., 3 ht.	325 to 1300	1.6 to 6.5
Stove, traveler's	200	1
Toasters, 9 in. by 12 in., 3 ht.	330 to 880	1.6 to 4.4
Toasters, 12 in. by 18 in., 3 ht.	500 to 1500	2.5 to 7.5
Urns, 1-gal., 3 ht.	110 to 440	0.5 to 2.2
Urns, 2-gal., 3 ht.	220 to 660	1.1 to 3.3
Urns, 3-gal., 3 ht.	330 to 1320	1.3 to 6.6
Urns, 5-gal., 3 ht.	440 to 1700	2 to 8.5
Waffle irons, 2 waffles.	770	3.75
Waffle irons, 3 waffles.	1150	5.75

In addition to the above table of household heating and cooking utensils, there are a number of other useful devices such as glue pots, soldering irons, leather finishing tools, drying tables for use in printeries and binderies, etc.

All forms of energy can be completely transformed into heat energy, but when the process is reversed, and it is attempted to transform heat energy into any other kind, considerable loss always occurs. Electric energy is a secondary form of energy. That is, it does not occur in a useful form in nature, but must be produced from some primary source, such as coal or water under pressure, and, therefore, the loss of heat from electric energy must always be greater than that obtained from a primary source and without loss."

From the above it might be inferred that the utilization of heat energy from electric energy must necessarily be very uneconomical. This, however, is not the case, inasmuch as the heat energy derived from electric energy depends primarily on the efficiency of the transforming device. In other words, a given amount of electric energy can be transformed into an equivalent amount of heating energy. The question, however, is to be able to utilize the maximum percentage of the heat energy so transformed.

Complete Electric Kitchen

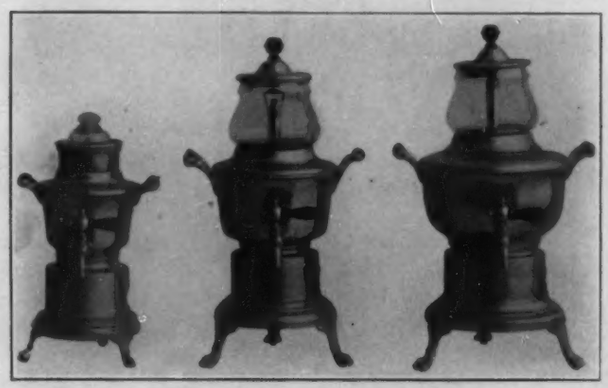
The electric flat iron is a very good example of the utilization of heat energy. It confines the heat to the proper place, very little radiation taking place from parts of the iron which are not in use.

Heat energy is derived from electric energy by passing the current through a resistance of suitable dimensions. The amount of heat energy dissipated will depend absolutely on the product of the resistance into the square of the current. From this it will be seen that the actual number of heat units can be accurately predetermined, the efficiency of the heating unit depending upon the design of the unit itself, and the design of the device in which it is used. We, therefore, have to look to the ingenious engineer to give us heating devices of high efficiency. The short life of heating units can be often traced to poor design, inasmuch as the resistor has to work at a temperature considerably above that which would be necessary if the design of the appliance in which it is used were such as to utilize the maximum amount of heat produced.

The majority of heating devices, such as the tea kettles, combination cookers, water heaters, and stew pans, usually require from ten to fifteen minutes to reach the boiling point, whereas with the grids, hot plates, and such devices as require rapid heating, they take only from two to six minutes to reach an operating

temperature, assuming, of course, that the surrounding temperature is normal.

The electric coffee percolator is especially representative of the rapid strides which have been made in the art of design and manufacture of heating devices within the past several years. Actual tests on a 1½ pint size of the type of percolator shown in the illustration prove that water drawn from a hydrant, direct, at a temperature of 18 degrees C. required only 45 seconds to start to percolate, and only one minute and 40 seconds in the three pint size. In either case the percolation proceeds very rapidly and the coffee is finished in ten minutes or less. Such results are due to the improvement in the design of the heating unit, and also to the improvement in the design of the "pump" employed in the latter designs. It is a very easy matter to



Electric Coffee Percolators

calculate the time taken to heat a quantity of water to any definite temperature of heat not exceeding the boiling point from the fundamental formula given below:

$$T = \frac{V\ (T_2 - T_1)\ 1834}{P \times n}$$ in which

T is the time in minutes.
V is the number of pints (U. S. Measure).
T_2 is the final temperature of the liquid in degrees F.
T_1 is the initial temperature of the liquid in degrees F.
P is the consumption in watts.
n is the electric efficiency in per cent.

Take, for example, the one quart water heater having a consumption of 500 watts, an efficiency of 90 per cent, and which contains 1½ pints of water at 60 degrees F. The boiling point of water (using the final temperature in the above formula) is 212 degrees F. Therefore, substituting these values in the above formula, we have

$$T = \frac{1\frac{1}{2}\ (212-60)\ 1834}{500 \times 90} = 9.3 \text{ minutes.}$$

There is also a very simple formula for calculating the cost of heating any given quantity of water which can be determined from

$$C = \frac{c \times V\ (T_2 - T_1)\ 0.0306}{n}$$ in which

C is the cost in cents.
c is cost of energy per kilowatt hour.
V is the number of pints of water (U. S. Measure).
T_2 is final temperature in degrees F.
T_1 is initial temperature in degrees F.
n is electric efficiency in per cent.

The following table, which has been taken from the Solicitors' Handbook of the National Electric Light Association, gives interesting data regarding the energy required to boil water, and cost of same at various rates per kilowatt hour:

The initial temperature of water 60 degrees F., efficiency of apparatus 85 per cent.

Total Temp. F. reached.	Watts used for minutes. 5 min.	10 min.	20 min.	60 min.	Cost in cents with current at given rates per kilowatt hour. 3c	5c	10c	20c
ONE PINT WATER.								
100	173	87	43	14.4	.04	.07	.14	.29
150	390	195	97	32.5	.10	.16	.32	.65
175	498	249	124	41.5	.12	.21	.41	.83
200	606	303	152	50.5	.15	.25	.51	1.01
212	658	329	165	55	.17	.27	.55	1.10
ONE QUART WATER.								
100	346	173	87	29	.09	.14	.29	.58
150	779	390	195	65	.19	.32	.65	1.30
175	996	498	249	83	.25	.41	.83	1.65
200	1212	606	303	101	.30	.51	1.01	2.02
212	1316	658	329	110	.33	.55	1.10	2.20
ONE GALLON WATER.								
100	1385	693	346	115.5	.35	.58	1.155	2.31
150	3117	1559	779	260	.78	1.30	2.600	5.20
175	3983	1992	996	332	1.	1.66	3.32	6.64
200	4849	2425	1212	404	1.21	2.02	4.04	8.08
212	5265	2632	1316	438.7	1.32	2.19	4.39	8.77

In 99 cases out of 100 the central station manager can materially improve the load factor by a little study and careful consideration, and in view of the opportunities offered by heating devices for such improvement, I hope that you will agree with me that a vigorous campaign in favor of such apparatus should be undertaken at once.

With the introduction of high efficiency incandescent lamps, such as the tungsten and the tantalum filament, there might be noticed in some instances a reduction in the revenue from various lighting customers, and in such instances it would be necessary for the distributing company to find some means by which to compensate for such a reduction in revenue, due to the use of high efficiency illuminants. This is a question of vital importance in districts where the class of customers is such that an effort is made to save every cent which is expended for lighting purposes. It, therefore, becomes necessary to devise some means by which to maintain the load formerly furnished by carbon lamps, and to this end the popular heating devices will fill the desired want. This is, undoubtedly, a question which should receive serious consideration, and by a little perseverance and solicitation by the distributing company, heating devices can, in almost every case, be placed in houses which have reduced their consumption by the use of tungsten lamps. This is, indeed, an argument which can be, and is advanced in the solicitation of heating device business.

According to Consul-General Thomas Sammons, at Seoul, the Japanese Residency General authorities state that since taking over the telegraph and telephone lines in Korea, in July, 1905, the total length of the telegraph lines, then about 1930 miles, of which 895 miles were used for military purposes, has been increased to approximately 7000 miles.

UNDERGROUND ELECTRIC CONSTRUCTION.[1]

BY S. J. LISBERGER.

I have often been approached with many questions pertaining to underground electric systems, and have been asked all kinds of questions as to how we did it, how we started, and how we took care of or prevented the troubles that come to every system. It will be my endeavor to present to you the method in which we lay out and operate an underground electric system for distributing light and power.

First let us consider why wires are put underground. This is usually brought about by a congestion of overhead wires in a thickly populated business center; and the reasons usually assigned by police and other supervisory boards who draw up the ordinances, are those of danger to life and property, both under normal operating conditions, and especially in case of fire. To quote from one of the recent underground ordinances, it states:

> Overhead wires are a constant menace to life and property, not only by reason of danger of human beings coming in contact with such wires carrying a high voltage of electricity; but, further, of the danger of buildings becoming ignited from such wires, cables and devices, and of firemen being prevented by such wires from properly performing their duties in case of fire within the district.

It is customary on the part of the city fathers to divide the territory in which wires are to be placed underground into several districts, in order that the financial burden may not fall upon the company within too short a period. These districts are described as "underground districts," and in the description said district embraces all territory within certain boundary lines. Sometimes these boundary lines will bound four or five blocks; while at other times the boundary line will only bound a single street between certain limits.

As a rule all companies maintaining overhead wires for any purpose whatsoever, with the exception of the span and trolley wires of the railroad companies, are required to place their wires underground in the district, although in some cases the feed wires of the railroad companies are exempted.

Certain clauses are covered in the ordinances permitting posts to be used for the exclusive support of lamps, and such terminal poles and other appliances as may be necessary for reaching places of business at the terminals of underground wires. This permits the use of terminal poles such as are used by the telephone company and the lighting companies (although mostly by the telephone company) whereby they place a pole in an alley or in the center of a block and distribute to all consumers' premises from that point.

Having determined the underground district, the next point at hand is to make a thorough survey of the district. The type of buildings must be thoroughly studied. It must be carefully noted as to whether they have basements or not; where the existing wires are brought out; the location of the gas and water mains, together with the conduit systems belonging to the telephone and telegraph companies; the positions of the sewers; and, in fact, the locations of all pipes in so far as records will show. The easiest way of doing this is to make a copy of the insurance maps, which show the property lines and the type of buildings existing, and upon these maps to enter what records can be obtained from the other companies as to their systems.

Having done this, the next step is to make a careful survey of the type of service to be taken care of—i. e., whether it is entirely lighting load or a mixed lighting and power load; what type of street lighting service is at present in use, and whether same can be continued in use in the underground system.

The load data is usually obtained by making a survey of the consumers' premises and noting on maps and record sheets exactly what is installed in each place. This is a long and slow piece of work, but most important, as this will determine the density of load in the district.

The next step should be a careful survey of the district with the view of estimating, in so far as possible, the possible growth of business in the territory. In many cases it will be impossible to do this; but there are always certain indications that stand out pre-eminently as to whether it is a growing district or whether business is being gradually transferred to another part of the city.

We now have before us a map of the district, with all of the water mains, gas and other pipes in the district, a complete record showing the load to be taken care of at the present time, and an estimate of the future load. We are now prepared to see where we shall locate our duct lines. If the street is very wide—take for example a street like Market street in San Francisco—it will be necessary to build duct lines on both sides of the street; but if it is a street only about as wide as Sutter street it will be necessary to build only one duct line.

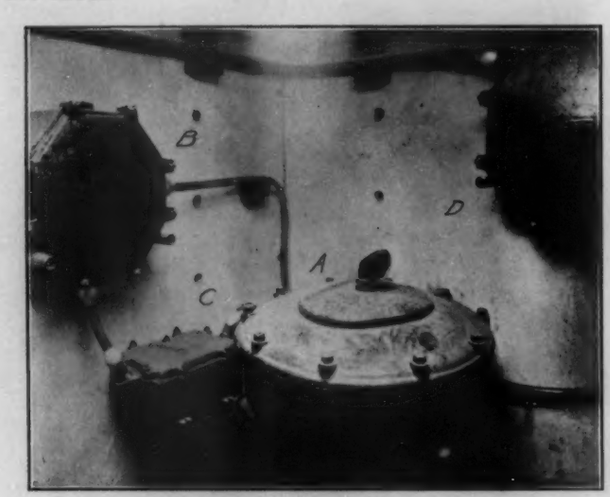
We know the various classes of service to be taken care of, and we are in a position, therefore, to determine as to whether our service for lighting work shall be alternating or direct current and whether we shall put in a direct current system to take care of both lighting and power work. These are questions of much importance; and as to the exact methods of how this is done it is not necessary to dwell upon here, for the processes are long, difficult and tedious. I will say, however, that in very large cities, such as New York, Baltimore, Boston, Chicago, and the like, the supply is altogether direct current, the mains being fed from substations located at suitable load centers; while in San Francisco we used a mixed system—i. e., both alternating and direct current.

We are now able to determine how many duct lines we shall lay to take care of our present service, and how many extra, or spare, duct spaces we should lay to take care of future work. This is also a point that requires careful study and good judgment, inasmuch as the cost of digging up the streets at a future date and the laying of additional duct lines will be high; while on the other hand the original installation of too many ducts means a large expenditure of unnecessary capital.

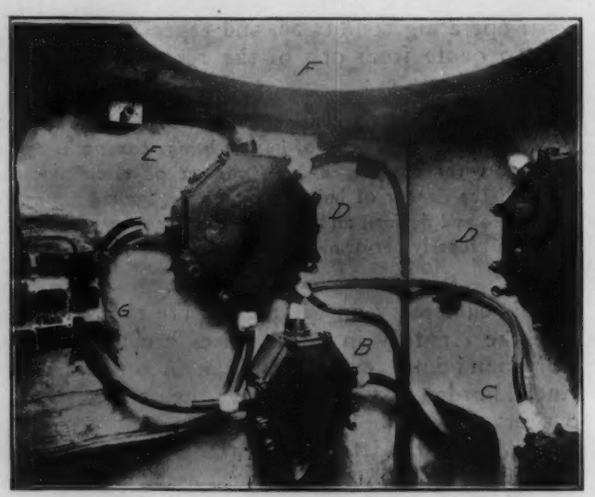
Dwelling upon the nature of the duct lines; there are several systems in use. The most popular, and, in fact, the most used system is what is known as the draw-in system. This consists of vitrified tile or ducts which are laid in a trench and entirely surrounded by

[1]Paper read before Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

concrete. There are other systems, some of which are in use in San Francisco, consisting of a wood trough in which the cable is laid. There is still another system, mainly used in direct current work, called the "Edison tube," (which, incidentally, was the first type of underground conduit ever installed) consisting of copper rods imbedded in an insulating compound, and all enclosed in a pipe. At the end of this pipe the rods project sufficiently to allow contact to be made by means of links to another section of the rod. At these joint points an enclosing box is put over the joint and poured full of a hot compound. The draw-in system has also been installed of late with fibre tubes encased in concrete, making practically a monolithic construction when sufficient concrete is used between the tubes.



View in a Manhole. Transforming Oil Fuel Box and Junction Boxes.
A—50 k. w. Subway Transformer. B—Primary Junction Box. C—Primary Oil Fuse Box. D—Secondary Junction Box. E—Socket for Test Lamp. F—Opening in Top of Manhole. G—Duct Line.



View in a Manhole, Showing Junction Boxes and Primary Oil Fuse.
A—50 k. w. Subway Transformer. B—Primary Junction Box. C—Primary Oil Fuse Box. D—Secondary Junction Box. E—Socket for Test Lamp. F—Opening in Top of Manhole. G—Duct Line.

The draw-in system is the most used, for the reason that additional cables can be drawn in when necessary, providing there are spare ducts, and the old cables can be drawn out in case they become too small or if the cable has lived its natural life.

The next step in the work is to lay out the manholes and the service holes of the system. Manholes are usually located at the intersections of streets, from which duct lines emanate in several directions, and at which points transformers, fuse, junction, and other boxes are located.

Service holes are usually located in the centers of blocks, and are the points from which the cables run from the mains to the individual services.

The manholes and service holes are usually built of concrete, although they are very often built of brick. The brick hole usually looks the neatest, but the concrete hole is more nearly water-tight and usually preferable to brick. The manholes are usually about 6 ft. x 7 ft., and about 6 ft. 6 in.high in the clear; while the service holes are usually about 4 ft. square and 42 in. deep. Manholes are provided with a 36 in. cover, and service holes with a 28 in. cover.

The service holes are usually so laid out that the primary, or high voltage feeders, are not exposed. This is done by carrying the duct lines straight through the service holes and concreting around them, and so locating the secondary ducts as to give a break where cables are brought in and taps are made.

The location of alleys, building, and the class of load will largely determine the location of the service holes; although in building in undeveloped territory the service holes are located as near as possible to the property lines and spaced equidistant between manholes.

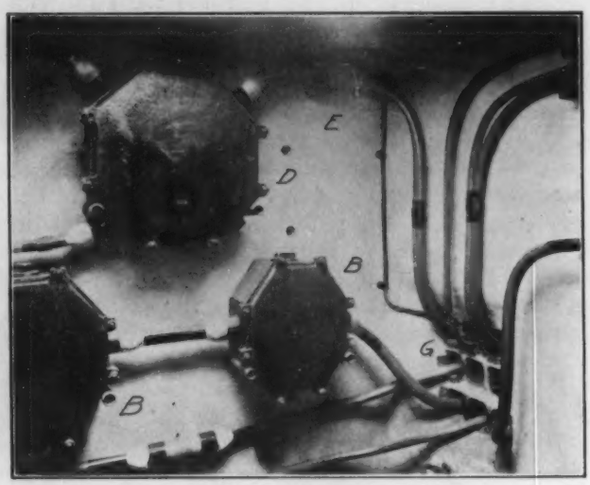
As no transformers are placed in the service holes in the case of alternating current systems, the feeders must then be determined of such size as to deliver the proper voltage at the service point. Thus you will see that we first determine the load; next determine the location of the service hole from which it shall be supplied; then determine our feeders, so that the drop from the manhole to the service hole to the consumers' service will not be excessive. In other words, we work backwards from the consumer's premises to the manhole. Of course, where there are many services supplied from the same service hole, and therefore from the same feeders, the aggregate or average of this system will have to be taken in the proper design of the feeders. You will thus see that a transformer will feed possibly in four directions, not including the services taken out of the transformer hole.

At the present time the San Francisco Gas & Electric Co. have no transformers in their underground systems in excess of 125 k. w. capacity, although the transformers for underground work are made as high as 300 k. w. capacity, and will pass through a 36 inch manhole. It is thus necessary to locate the transformers in adjacent manholes and to pull in ties from the manhole, through the service holes, to the next manhole; in other words, to bank transformers. Occasionally, these secondary tie cables are pulled in, where service conditions justify same, but the fuses not put in. This so that in case one transformer goes out of service the other transformer can immediately be put into commission by putting in fuses.

I have not spoken at all of how the services are run from the manholes or service holes to the building proper. In houses where there are basements, the

iron pipes are extended from the service hole directly to the basement. In the majority of cases—especially in the smaller towns where few of the houses have basements—the service pipe is extended under the show window, and the tap to the cable made under the show window. Very often conditions are such that this condition cannot be applied, so service pipes are run out of the manhole and up the front wall on property lines. The cable is given a proper terminal finish at the top, and from this point, iron armored conduit with rubber covered wire is run to the point of entrance.

Where the cable enters the building—for example, in a basement—a cutout switch and fuses are installed in accordance with the Underwriters' rules, same being enclosed in a sheet iron box, or a wood box lined with asbestos or sheet iron, according to the requirements. Several other forms of service boxes are used, and many of these are better than the sheet iron box; but the expense of the installation does not justify the use of same.



View in a Manhole, Showing Junction Boxes.

A—50 k. w. Subway Transformer. B—Primary Junction Box. C—Primary Oil Fuse Box. D—Secondary Junction Box. E—Socket for Test Lamp. F—Opening in Top of Manhole. G—Duct Line.

The next step is to lay out the primary feeder system. This, as a rule, is quite simple, as the transformers of known capacity have been located. The first step is to find the center of distribution, and to so design the feeders that the drop in voltage from the center of distribution to the several feeding points will be uniform, so as to avoid any difference in voltage throughout the system.

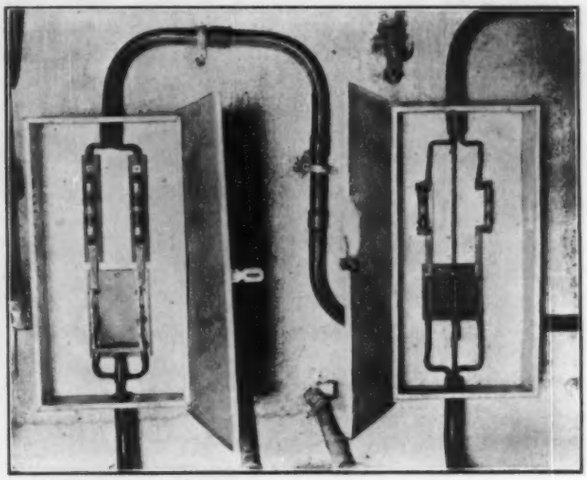
In the case of polyphase systems the cables are usually three conductor, paper covered, lead insulated; or, if the system be two-phase, they are four conductor of the same design. Likewise we work backwards from the transformer or group of transformers in determining the proper size of the primary cable, to the center of distribution, and from the center of distribution we work back to the point where we feed into the underground; be it from the overhead lines, or be it underground directly from the station.

In case of overhead lines that feed into underground districts, we extend from the manhole to the terminal pole an iron pipe, usually about three inches in diameter, and where the cable comes out of the end of the iron pipe we make a pothead and place a box over it to protect the pothead from the weather, pouring the pothead full of an insulating compound, and bringing the leads out of the box through porcelain terminals.

In late practice we are beginning to use an open air terminal made of aluminum and brass, where the cable is wiped onto a brass terminal and the leads brought up in through same and out of insulators which are made water tight. This does away with the wooden box and makes a more sightly terminal pole, and does away with all danger of fire from the box.

The primary cables, in case they are what we call "through feeders"—that is, when they run through the district—are spliced in the manhole. The splicing consists in joining the cables, wiping a lead sleeve over same, and filling this lead sleeve with insulating compound.

In our system, in case the primary cables are distributing feeders—that is, if they feed transformers located throughout the district—we use a primary box.



View in a Basement, Showing a 220-Volt, 3-Wire and a 500-Volt, 2-Wire Service Box.

This is a cast iron box about 18 inches in diameter, into which the cables are brought through brass nipples, a gasket being used on the box so as to make it water tight. This box contains terminals and studs, whereby the feeder can be disconnected from the manhole, and the branch feeders can be disconnected as well as the transformer taps; and gives a very flexible method of operation as compared to the old style solid type of lead sleeving, where the feeder had to be killed before any disconnecting could be done. These boxes can be operated with the current on, with reasonable safety if proper precautions are taken, and in fact it is being done every day in the San Francisco, Oakland and San Jose systems.

The transformer tap from the primary box is taken out through a nipple in the same manner that the primary feeder is brought in, and extends into a fuse box This fuse box is about 8x12 inches, about 5 inches deep, and contains fuses submerged under oil. It, too, has a watertight top, fitted with a gasket, and is so designed that the fuses can be operated while current is on, with no danger to the attendant. We also have a secondary box which has two bus bars, the neutral not being carried through the box but being run through the under-

ground system as a weather-proof wire grounded by means of ground plates in the manholes, put in when same are built.

On the transformers and the main feeder cables, same are fused by means of brass fuses which are located between the bus bar and the stud. These are fused, not for overload purposes inasmuch as this condition is taken care of by the individual fuse box on consumers' premises, but are fused against short circuit; in other words, for system protection, and this is the only point at which the system is fused, other than the fuses in the oil fuse box on the transformer.

With direct current systems the condition varies slightly. There are no transformers; hence there is no primary cable and the system is somewhat simpler. The cables from the station are so designed as to deliver proper voltage at certain distributing centers, and the services are connected to a junction box which has a cover flush with the street. There are two annular rings with studs, and the services are fused between one bus bar ring and the stud. All cables are brought into the bottom of the manhole, and are wiped onto the bottom; and hence, in the operation of the box, it is not necessary to go into the manhole or service hole at all.

I have often been asked in reference to the damage that water would do. In our new designs all the manholes are connected to the sewer by means of a back trap, which allows the water to flow from the manhole to the sewer; but in case the sewer fills, does not allow the water to back up into the manhole. Thus we do not fear any trouble from water. The service hole drains to the manhole, and the little water that seeps through the concrete lining of the duct line flows off easily to the sewer. Even should the manhole fill with water, the wiped lead joints and the watertight gaskets would prevent any damage being done to the cable system.

In cable systems the most trouble is experienced with primary cables—i. e., cables of high voltage—and therefore, in an ideal system, if the underground system can be fed from two points there is an insurance against shutdown if there is a cable connecting the two feeding points. Thus, if we get into trouble in the center of the section, we need only to open up a primary junction box, remove the connecting links in the manhole adjacent to the damaged sections, and operation is immediately restored. Ordinarily this would not cause a delay, in case of a burnout, for more than fifteen or twenty minutes.

I have referred in these descriptions of cables and systems, to a distributing system, and not to a high tension system connecting the power house and substations; although in such systems we have cables running from the main station to the several substations, with ties from substation to substation, thus affording the same insurance against shutdown.

Vice-Consul-General Frederic W. Cauldwell, of Cairo, advices that the British vice-consul at Alexandria, in his report for 1908, states that steam plows are becoming more popular in Egypt each year. In the last six years, he says, over 150 sets of a patent steam plow of British make have been sent to Egypt. Each set consists of two engines and one cultivator and can plow 20 feddans (21 acres) per day.

THE OIL GAS RESIDUAL, AND HOW TO HANDLE IT.[1]

BY R. P. VALENTINE.

A striking thing in connection with the history of the productive industries is the curious fact that the realization of the value of the by-products, and the problem of handling and converting the same, assume importance only at a point where the mother industry has reached a high stage of development. I need only mention such instances as those of the packing houses and the oil refineries, where residual products offer an opportunity for profits almost as great as those accruing from the original product itself. This phenomenon is now manifesting itself in the oil gas industry, though necessarily in a comparatively small degree, and I take this as an indication that the process of oil gas manufacture has reached a state of stability—that it has established its integrity among the industries. I, of course, refer to the production, handling, and disposition of lamp-black, practically the only by-product from the manufacture of oil gas, and the importance which the problem has recently assumed.

The members will recall that lamp-black (as the gas man knows it) is a residue peculiar to the oil gas process. It is only in this process that we meet with the chemical conditions necessary to produce it, namely a rich hydro-carbon fluid and a heat sufficient to decompose the hydro-carbons. The reclaiming of the by-product, and the uses to which it may be put, will be the subject of this paper, although I will devote some space to the problem of cleansing the gas beyond the point where the lamp-black is drawn off.

Since the beginning of the oil gas process the scheme for drawing the carbon-bearing water from the wash-box to the lamp-black separators has been practically the same until very recently. You are all familiar with the open seal pot with its vent into uncovered troughs, through which flows the laden wash water into the separators which have been variously and clumsily devised. With a number of the schemes that have been tried in the endeavor to construct a good, practical separator, many of you are perhaps more familiar than the writer. You know that overflow pits have been constructed with burlap, excelsior and hay strainers, and all of you have seen the ordinary partition separator, which finally came to be the one most commonly, and perhaps most successfully used. This separator, as you all know, is the one in most common use to-day. It consists of a huge box sunk in the ground, and varying in size according to the output. The box is oblong, with the inflow at one end, and so arranged that the flow of water is obstructed by a partition reaching from the top of the box almost to the bottom. The water flows beneath this partition and over two succeeding ones placed some distance apart, and extending from the bottom of the box to within a few inches of the top. A skimmer is usually placed immediately before the third partition, deflecting the water some inches below the overflow; beyond this point the water floods over into the sewer or some other off-take. The dimensions and proportions of the separator will vary under different conditions, and with different individuals, but the system is usually the

[1] Paper read before Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

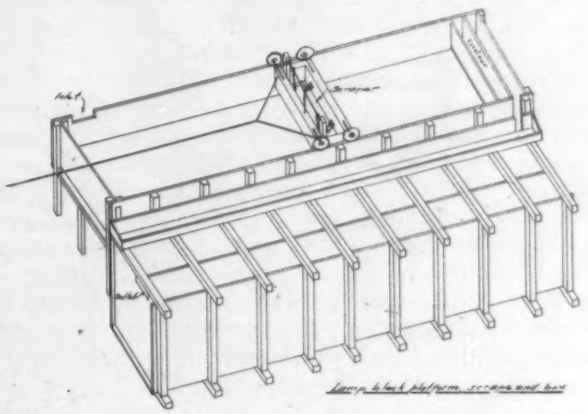
same. The process is successful in robbing the wash water of a goodly proportion of the lamp-black, but the fact remains that it is far from perfect; a large amount of the lamp-black is bound to escape, and without a relief box it is impossible to drain off the box in use, while making gas, without allowing the wash water to flow off uninterrupted.

In connection with this system the methods heretofore practiced in removing the lamp-black from the box have been most unsatisfactory. After draining the box, the lamp-black is usually shoveled by hand onto platforms placed at the sides for the purpose, where it is left to drain, and afterwards wheelbarrowed to the fire room. Mechanical devices such as steam shovels, small tram cars and various kinds of scoops are frequently used instead of manual labor and shovels, but in any case the job is slow and expensive, and eminently unsatisfactory.

Following the natural course of events any imperfect process will seek to right itself in time. In the particular case under discussion, an improvement has finally worked itself out which is rapidly displacing the old process in many localities, and which will, I doubt not, eventually become adopted by every progressive oil gas plant. The scheme which I have in mind may briefly be described as follows:

Abandoning the old seal pot, we now run the waste water from the wash-box in a pipe dropping from the overflow into a trench, which carries it underground to a point at the head of a platform about four feet in height, whence the pipe rises flush with the top, where it is crowned with an elbow, through which the water flows out upon the platform. It will be seen that the pipe when laid in this manner forms a trap which effectively serves as a seal, and it is readily kept clean by turning the blow-off from the boilers into it. The platform which I have mentioned is the separator. It is rectangular, and, let us say, 10x14 ft. It is perfectly level with sides rising 16 in. above the floor, while 12 and 24 in. respectively from the end opposite to the flood pipe are partitions extending to within 1 in. of the bottom. These partitions, placed so close together, form a sort of a box, which is stuffed with excelsior, or some similar material. We will now suppose the separator to be in operation. The water laden with lamp-black flows from the pipe onto the platform, where it spreads out thinly over the floor, depositing most of its lamp-black evenly over the surface. The aperture beneath the excelsior stuffed box is just large enough to prevent the accumulation of the water and as it seeps through the excelsior serves as a strainer, removing practically all of the remaining lamp-black from the water. But to make assurance doubly sure, the process is continued. After seeping through the excelsior the water drains off into a trough extending lengthwise at the side of the separator; from this it flows into one of the old style separators arranged with the partitions running lengthwise. The water is now almost unnecessarily put through the old separating process, from which point a sufficient amount of the water to operate the first scrubber is returned to that machine, preferably by means of a centrifugal pump, and the remainder is drained off into reservoirs, whence it is pumped into the general water distribution system for the apparatus. The reason for using the warm separator water in the first scrubber I will describe in a succeeding paragraph.

For efficiency the process which I have described is far superior to any arrangement which has preceded it. So thoroughly is the water cleansed of lamp-black that it can be used over and over again; but there is one other advantage to the system, which is perhaps as important as all others combined. I refer to the labor-saving device used in connection with the separator for the purpose of removing the lamp-black. You will recall that the floor of the separator is surrounded by 16 in. sides. I will now add that the end nearest the inflow pipe is removable, and the pipe itself is arranged so that it can be swung back. A large scraper of a breadth equal to that of the floor of the separator is held in suspension on four wheels resting on iron railings placed on the sides. This scraper can be lowered upon the floor of the box, and is operated by means of a chain running through the necessary pulleys to a convenient engine shaft, or other revolving mechanical device, around which the loose end of the chain is wrapped. By drawing this loose end taut the scraper



will be drawn forward. In this manner the separator is relieved of the accumulated lamp-black which is scraped out upon draining shelves and thence thrown upon the floor of the boiler room. This scheme does away with practically all the expense and inconvenience necessary to the old method of removing the lamp-black by hand.

At this point I wish to digress for a few moments to discuss what I consider the best and most effective means for cleansing the gas. I will state at the outset that I am in favor of four vertical scrubbers, into which large quantities of water are sprayed at the top, three of them serving to wash the gas before it reaches the purifiers, and one operating between the purifiers and the receiving holder. To remove the heavy tar from the gas the first two scrubbers should entirely suffice. These scrubbers should be constructed internally of gratings made of 1 x 6 boards 1¼ in. apart, arranged alternately right and left. I am thoroughly convinced that the style of scrubber is most efficient for the first part of the cleaning process, not only because its arrangement is best suited to the work of removing the particles of tar, but because it permits of a free precipitation of these particles to the bottom of the scrubber, which can be steamed out daily.

It is in the first of these scrubbers that I recommend the use of water returned from the separator.

This is hot water, somewhat over a hundred degrees, and because of this fact its use in the scrubber will prevent any hardening or over stiffening of the precipitated tar, and the result will be a more rapid and thorough cleaning when the scrubber is steamed. Those who are familiar with the difficulties that so often arise as a result of a gluing up of the lower grating will appreciate the advantage of this proposal.

On the subject of the waste water from this first scrubber, I have another suggestion to offer. This water contains considerable tar that might better be dumped out on the lamp-black separator than disposed of in any other manner. If lamp-black and tar are used directly for fuel, as is usually the case, why not mix them in this manner? And if, as is sometimes done, the lamp-black is briquetted, a certain amount of tar will facilitate the process. It is for these reasons that I recommend running the water from the first scrubber through the separator, and as for getting the water there, what is so simple as to connect on to the overflow pipe from the wash-box, using the same enclosed seal? If no other advantage is gained, we shall at least avoid the nuisance of an open seal on this scrubber.

The third scrubber, which should carry the washing process up to the purifiers, should, I strongly urge, be filled with round cobblestones. The more thorough work necessary in this scrubber, in order to remove the finer particles, requires a tortuous passage of the gas through the water, but at the same time a filling must be used that will allow of the settling of the substance removed. It is with these requirements in mind that I recommend cobblestones above any other filling of which I know.

The fourth scrubber, which, as I said, should be placed between the purifiers and the receiving holder, is for the sole purpose of removing from the gas whatever dust particles might have been picked up during the passage of the gas through the purifying material. It is my confident belief that a great proportion of the trouble in services and burners that has usually been attributed to naphthalene and tar, is in reality due to dust accumulated by the gas in passing through the purifiers, and to remove this the post purifier scrubber is, to my mind, essential; and as regards construction I can recommend no better scheme than a series of baffling plates, for by such an arrangement the gas is thoroughly rinsed.

In this connection I might also add that, just as in the case of the separator, where there should be no loss of water except by evaporation and seepage into the lamp-black, so here there should be practically no loss. The water from the scrubbers (except the first) should be run through a tar well, overflowing into reservoirs where the bulk of the water from the separator is stored. It is this conservation of the water to which I wish to call special attention, as it is a matter that has heretofore been much neglected in the gas making process, notwithstanding the opportunity it offers for a very considerable economy.

In concluding this paper I wish to say a few words about the disposal of the by-product, lamp-black. I am willing to make the broad statement that the usual way of disposing of this residual is a mistake and an extravagance. I refer to the use of the lamp-black under the boilers for fuel. My contention is, that there is a market for lamp-black in many forms, only waiting to be exploited to yield a return far in excess of the cost of any substitute fuel that might be used in the gas making process. Many of you who are familiar with the scheme of briquetting the lamp-black, an idea that has long since not only demonstrated its practicability, but has been commercially applied. I have in mind one company that has for over two years briquetted its lamp-black and sold it at a price of $14.00 a ton, a very remunerative return; and I will add that it has a demand for every pound it can turn out.

Another example that comes to my mind is the fact that briquetted lamp-black has been successfully used in the manufacture of water gas, having undergone tests in this application that show it the equal, if not the superior, of Welch anthracite coal. But in addition to the briquets, think of the other merchantable commodities that might conceivably be made from this substance; such articles as arc-light and electric battery carbons, coke, paint, pencils, come to my mind, and I doubt not that a great variety of serviceable and salable goods can be produced from it, if only sufficient time and thought were given to the matter. I repeat that it is a mistake and an extravagance to use this valuable residual under the boilers, and that the gas man of the future, coming to realize its possibilities, will devote his energies to opening up this market, with no mean profit to himself.

IN MEMORIAM

Pacific Coast Gas Association

JAMES GOODWIN.

Born October 14, 1864. **Died November 15, 1908.**

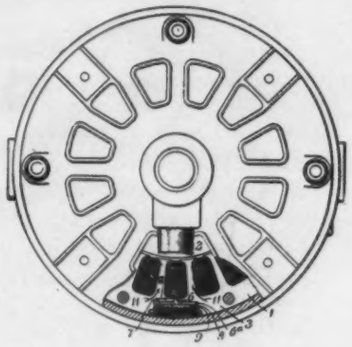
James Goodwin was born in Philadelphia October 14, 1864. In his early days he studied law in the office of John and C. W. Sparhawk in Philadelphia, remaining with them for sixteen years. In 1889 he entered the service of his country as assistant quartermaster on the transport Grant, and performed faithful services in the Philippines for four months. Returning to California he made his home in Bakersfield, entering the employ of the Power Transit and Light Company. His fidelity and intelligence earned him steady promotion and he became successively assistant manager, and on October 1, 1908, manager, and was placed in full charge of the company's interests.

On June 14, 1886, he was united in marriage to Miss Sallie Sacrey in Philadelphia, and his widow and one son, James, 18 years of age, survive him. Mr. Goodwin was interested in athletics and the construction of Athletic Park at Bakersfield is due to his enthusiastic good work. In the order of Elks and Woodmen of the World he was particularly active and devoted much time to advancing the interests of these bodies, and under their auspices the last sad rites were performed at his funeral.

Mr. Goodwin joined the Pacific Coast Gas Association at its twelfth annual meeting, July 12, 1904, and retained an interest in association work up to the time of his death. Few men had a wider local acquaintance than Mr. Goodwin, and none were more generally esteemed. Genial, kind and courteous, and generous to a fault, he held a warm place in the hearts of all who came in contact with him. His loss brings sorrow to the members of the Pacific Coast Gas Association.

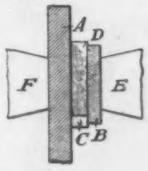
PATENTS

934,466. Starting Device for Electric Motors. Harold M. Scheibe, Wilkinsburg, Pa., assignor, by mesne assignments, to Westinghouse Electric & Manufacturing Company. In an electric motor, the combination with primary and secondary members, and an auxiliary starting winding, of a circuit



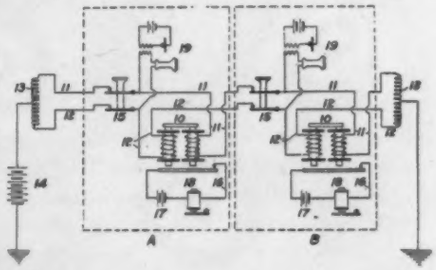
making and breaking device for said starting winding, the operation of which is dependent upon the cross magnetizing flux in the primary member.

934,854. Process of Electrically Welding Metals. Charles R. Sturdevent, Worcester, Mass., assignor to American Steel & Wire Company, Worcester, Mass. The herein described method of heating metal surfaces, which consists in insulating



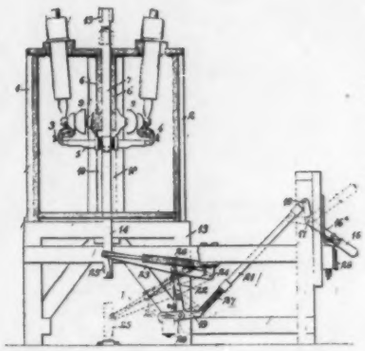
the surfaces from each other by a fusible insulating material, and placing a body of fusible fluxing salt, having a lower fusing point than the insulating material, between the surfaces, and passing a current through the body of fluxing salt until the insulating material has melted.

934,811. Means for Reducing the Reactance of Electromagnetic Devices for Telephone-Circuits. Winthrop K. Howe, Rochester, N. Y., assignor to General Railway Signal Company, Gates, N. Y. The combination of a two-wire telephone



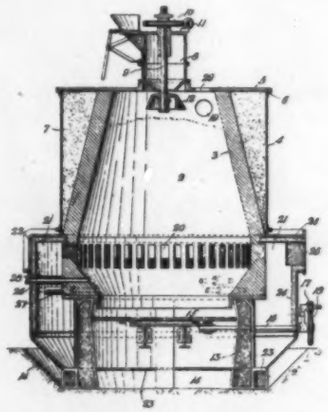
circuit, a series of telephones connected with the two wires of the circuit, a series of keys for making and breaking both lines of said circuit, an electro-magnetic device having two coils, one in each of said lines and a tubular copper sheath immediately around the core of each coil, and a source of current connected with said telephone circuit for energizing the electromagnetic device.

934,474. Electric-Circuit Interrupter. Harve R. Stuart, Wheeling, W. Va., assignor to Westinghouse Electric & Manufacturing Company. In a circuit interrupter, the combination with fluid-containing tanks, stationary contact members in each tank, conductors, or leads connected to the stationary



members and projecting out of the tops of the tanks, of movable bridging contact members to co-operate with the stationary contact members, upright insulating rods attached to said bridging members, an insulating cross-bar which interconnects the upright rods, and means located below the tanks and connected to said cross-bar for simultaneously moving the bridging members into and out of engagement with the stationary members.

934,446. Gas-Producer. Henry I. Lea, Pittsburg, Pa., assignor to the Westinghouse Machine Company. In a gas producer, a truncated cone shaped ash chamber, a truncated cone shaped gas generating chamber above the ash chamber, the two chambers being connected together at their greatest diameters, a blast admission port provided near the top of the



gas generating chamber, a liquod sealed bottom for said ash chamber, an annular row of gas delivery ports located at the juncture of the two truncated cone shaped chambers, an annular collecting chamber surrounding the lower portion of said producer and surrounding the gas delivery ports and a water sealed recrement dischange port.

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Plans are now being perfected to hold an electrical show in San Francisco early in December. This should meet the active support of all manufacturers and dealers as it offers an excellent opportunity for popularizing the use of electric appliances.

In all probability the city of Chicago will enforce a measure making compulsory the electrification of all railroads within the city limits. This is in line with the policy of abolishing the smoke and cinder nuisance, for which the steam locomotive is largely responsible.

Electricity has been assigned a new function, that of preserving the health of the community. St. Petersburg, Russia, is to adopt the ozone process for the purification of drinking water, and hopes to thus check the spread of epidemics. The ozone is produced by electric power.

An electrical earthquake alarm was recently exhibited by Signor Maccioni before the Academy of Science at Tuscany. Any earth tremor is detected by means of a coherer, a sensitive galvanometer and a battery connected to a buried metal plate. These are connected to a registering and alarm mechanism. In slight tremors the electric waves were noted four seconds before the mechanical disturbance.

In view of the cordial reception that has been given the initial issue of the Pacific Metal Worker Department of the "Journal of Electricity, Power and Gas," and in response to an earnest request from many of the prominent metal trades operators on the Pacific Coast for a publication devoted exclusively to their interests, it has been decided to issue the Pacific Metal Worker as a separate monthly periodical. This department is consequently omitted from this number. Further details will be published later.

The domestic fuel of the future will be electricity. The seller of electric cooking apparatus today meets much the same opposition as did the incandescent lamp salesman a few years ago. The great advantage of electric cooking is its convenience and cleanliness; its disadvantage is its cost. The latter is constantly decreasing, while the cost of coal and oil is correspondingly advancing. The possibilities of electric cooking were exhibited last week at a dinner served to the electrical jobbers of the Pacific Coast at their Seattle meeting, wherein all the food was cooked in an electric kitchen. The variety and efficiency of this apparatus is illustrated in an article in this issue by Mr. A. G. Jones, which contains matter of interest to every central station operator.

Electric Mining

In his presidential address at the Spokane meeting of the American Institute of Mining Engineers, David W. Brunton attributed the cheapening in the cost of mining to the wonderful advances that have been made in mechanics, chemistry and electricity, laying particular emphasis upon the latter in the course of a brief word of appreciation as to the benefits being rendered the mining industry by the long distance transmission of electric power. "While a few mines are favorably situated for the utilization of adjacent water power, many of the principal mining districts of the United States are at altitudes so great that any available water power is far below them. Again, as in the case of Nevada, Arizona and portions of Utah, the mines occur in an arid country where it is difficult to obtain sufficient water for domestic purposes, to say nothing of power. Already the electric current is carried to all elevations from sea-level to timber-line, and there is scarcely a desert mining camp of sufficient size to justify the erection of a pole-line that is not equipped with electric power. The ease with which this overcomes the old and apparently insurmountable problems of scarcity of water and fuel constitutes one of the delights of modern mining." In summarizing the important improvements in western mining practice, there is scarcely a subdivision named in this speech which is not intimately associated with electric power.

Of the various applications of electricity to mining, electric hoisting is perhaps the most important, being valuable alike for surface work where boiler feed-water is scarce and for underground sinking where smoke and fume is objectionable. Recent improvements in induction motors allow wide variations in speed and some system of storing energy, such as the Ilegner revolving fly wheel, eliminates the peak demand in starting and accelerating the load. Closely allied to hoisting is underground tramming, for which electric traction is fast being adopted as a substitute for mule and man power.

Aside from these problems of the transportation of ore, mining engineers are much concerned in the economical handling of water to be removed and air to be admitted to underground works. There are few mines where constant pumping is not necessary to prevent flooding and continual effort being made to provide good ventilation. Natural means are employed so far as possible, but where gravity is unfavorable, electricity is readily available. For handling water we have either reciprocating or centrifugal pumps efficiently and conveniently driven by electric motors. The high head multi-stage turbine pump can now be made to lift to a head of two thousand feet. It is a moot question, however, whether it is not more advisable to have the stages in the shaft rather than in the pump. The manifold advantages of an electric driven ventillating fan are causing its introduction into mining work. Electric drive of air compressors is also proving satisfactory in supplying power for drilling. A thoroughly practical rock drill, which will meet the exacting requirements of a prejudiced miner, has not yet been put upon the market, though the electric coal cutter has been found eminently satisfactory.

For ages the miner has groped his uncertain way through drifts and stopes by the light of a flickering candle or an ill-smelling oil lamp. Extinguished by a breath it plunged the bearer into total darkness with great danger of a further plunge into an unguarded winze. Today there are but few stations and levels in a modern mine that are not electrically lighted. As a consequence the work is better done and the miners' health better preserved. For portable use the storage battery tungsten lamp is also becoming a valuable means of exploring dark underground recesses.

The mine telephone, giving direct and instant communication from the most remote workings to the surface, is of untold convenience, as is also flashlight signaling by interrupting the current passing through the incandescent lamps, which is replacing the time-honored bell and cord.

Passing from the underground workings to the surface we find electric timber-framers and machine tools doing better work in less time than can be accomplished by hand labor. The blacksmith may use an electric drill sharpener and harden his drills to an exact nicety in electric tempering furnace. In the mill individual motor drive of crushers, stamps and concentrators does away with unsightly and cumbersome shafting and belting, together with its attendant inefficiency. The magnetic and electrostatic properties of certain minerals makes possible their separation from the gangue and thus concentrates them for other treatment.

In metallurgical work electricity is daily increasing in value. The latest practice in the chlorination process is to produce the chlorine by electrolysis. This method has been adopted and is in everyday use in the United States Mint, as is also the electrolytic deposition of gold and silver from their solutions. In the cyanide process, bright minds are now at work on this same problem,

The greatest opportunity for metallurgical work is the adaptation of the tremendous heat of the electric current to the smelting of ores. This is already in successful use in treating iron and zinc and, with increasing cost of fuel and decreasing cost of electric current, will soon be applied to the other metals. So rapidly are the manifold advantages of electricity being applied to every department of mining work that a knowledge of the principles of electricity will be as indispensable to a mining engineer as is an understanding of chemistry and geology.

JOURNAL PORTRAITS

Chester Hicks Pennoyer was born in San Jose, California, on March 1st, 1874, going to school in San Diego and San Francisco and graduating from the course in electrical and mechanical engineering at the Electrical Engineers' Institute, New York City. He entered the employ of the California Electric Light Company of San Francisco on January 1st, 1889, continuing with them as superintendent's clerk and foreman of the morning shift until this company was succeeded by the Edison Light & Power Company, then becoming assistant to the superintendent and purchasing agent and in charge of construction work. The Edison Light & Power Company was succeeded by the San Francisco Gas & Electric Company, with whom he remained until 1902 as purchasing agent and chief commercial agent.

Mr. Pennoyer was one of the organizers of the Consolidated Light & Power Company of San Mateo County, which company consolidated the plants of the Peninsula Lighting Company, San Mateo Gas & Light Company, and San Mateo Lighting Company. He was director and manager until a new merger took over the Consolidated Light & Power Company, together with the San Jose Light & Power Company and

Chester Hicks Pennoyer

Electric Improvement Company of San Jose, forming the United Gas & Electric Company. Of this he was director and general manager and at the same time secretary and general manager of the Standard Electric Company of California. He built the oil gas works at San Jose and Redwood City, installing McIntosh & Seymour and General Electric auxiliary apparatus in San Jose and Redwood City.

He remained with the United Gas & Electric Company for thirteen months after its absorption by the California Gas & Electric Corporation, as division manager. He then became associated with the National Conduit & Cable Company as Pacific Coast manager until 1908, which position he resigned to become general superintendent for the Great Western Power Company, and also of the West Coast Construction Company. The West Coast Construction Company had the construction of the entire hydro-electric and steam generating plants and systems of the Great Western Power Company's 72,000 h. p., 159 miles of steel tower double circuit line. He organized the first operating force of the latter company, which began delivery of power December 23, 1908. He resigned from the Great Western Power Company and the West Coast Construction Company, July 1st, 1909, to return as Pacific Coast manager of the National Conduit & Cable Company and the National Brass & Copper Tube Company, which position he now holds.

PERSONALS.

Geo. R. Murphy is at Portland, Oregon.

J. A. Yeatman, chief engineer of the United Iron Works, Oakland, Cal., has returned from Arizona.

F. Gottfried, vice-president of the Meese & Gottfried Company, has returned from the Mining Congress at Goldfield, Nev.

J. J. Cobbs, of Ford, Bacon & Davis, will be in charge of the changes at the United Railroads sub-stations, San Francisco

W. Barlow, superintendent of the Union Gas Engine Company of San Francisco, is again in his office, after a ten-weeks' illness.

H. A. Storrs is now associated with the firm of Field, Fellows & Hinderlider, 435 Century Building, Denver, Colo., as consulting electrical engineer.

O. W. Lillard, engineer for the Pacific Coast office of the Gould Storage Battery Co., left San Francisco this week to confer with the Eastern factory.

Chas. L. Turner has joined the sales staff of Pierson, Roeding & Co., of San Francisco, making a specialty of incandescent lamps, insulators, and fuse wire.

A. E. Beeling, formerly with the Chicago office of the Western Electric Co., has been appointed assistant treasurer of the San Francisco office of this company.

Otto H. Fisher has been made manager of the Union Gas Engine Company, having been in their employ for the last ten years and well acquainted with their output.

M. V. Watson, formerly assistant electrical engineer of the Central Colorado Power Co., has been appointed general manager of the Arizona Power Co., at Prescott, Ariz.

J. Hawkins, secretary of the Standard Gas Engine Company of San Francisco is in the east to get a line of eastern manufacturing and hopes to return by the end of November.

A. J. Quigley, formerly assistant electrical engineer of the A.-Y.-P. Exposition, is now sales manager for the Agutter-Griswold Co., electrical engineers and contractors, 411 Occidental avenue, Seattle, Wash.

C. B. Humphrey closes a valuable service of fifteen years with the Westinghouse Electric & Mfg. Co., during the last five years of which he was manager of the detail and supply sales department, to become a vice-president and director of the White Investing Co., 43 Exchange Place, New York City, which will undertake the financing, development and operation of enterprises based on natural resources, and deal in bonds and securities. Among the interests of the company are the Aguacate Gold Mines in Costa Rica, which are now being developed and will be in operation in the near future; the development and operation of a slate mine for the production of slate for roofing, electrical and industrial purposes will be undertaken at once, and a number of properties of other characters acquired. W. F. White, president of the company, was formerly manager of the Cincinnati Edison Electric Co., and later vice-president of the North American Co. For a number of years Mr. Humphrey was district manager for the Westinghouse Co. with headquarters at Cincinnati, and was called to the home office in 1904 to take charge of the detail and supply department, which in recent years has grown to an important factor in the total volume of Westinghouse business. Mr. Humphrey assumed his new duties October 1st.

ELECTRICAL JOBBERS AT SEATTLE.

The Pacific Division of the National Electrical Supply Jobbers' Association held its fourth quarterly meeting in Seattle, on September 27th and 28th. Those present were Andrew Carrigan, of Dunham, Carrigan & Hayden Company, San Francisco; T. E. Bibbins, of the General Electric Company, San Francisco; W. S. Berry, of the Western Electric Company, San Francisco; W. L. Goodwin, of the Pacific States Electric Company, San Francisco; F. H. Woodward, of the Standard Electrical Works, San Francisco; R. D. Holabird, of Holabird-Reynolds Company, San Francisco; C. C. Hillis, of the Electric Appliance Company, San Francisco; Frank Fowden, of Brooks-Follis Electric Corporation, San Francisco; H. V. Carter, of the Pacific State Electric Company, Los Angeles; T. E. Burger, of the Western Electric Company, Los Angeles; Mr. Kemp, of the Montana Electric Company, of Butte, Mont.; Mr. Hunt, of the General Electric Company, Portland, Ore.; Mr. Averill, of the Fobes Electric Company, Portland, Ore.; P. J. Aaron, of the Western Electric Company, Seattle, Wash.; E. N. Fobes of the Fobes Electric Company, Seattle, Wash.; H. M. Winters, of the General Electric Company, Seattle, Wash.; E. C. Kilbourne, of the Kilbourne-Clarke Company, Seattle, Wash.; A. H. Elliott, secretary of the Pacific Coast Division, San Francisco; Mr. Overbaugh, secretary of the National Association of Chicago, and Mr. Debevoise, attorney of the National Association, of New York.

W. L. Goodwin — Again

The business meetings were unusually successful and reflected the harmony that now characterizes this branch of electrical industry on the Coast. The usual golf game was introduced as a part of the recreation, Goodwin, as usual, winning the cup. The following figures give the result in detail:

Players.	Strokes.	Handicap.	Net.
Carrigan	123	0	123
Holabird	104	0	104
Berry	126	6	120
Hillis	126	8	114
Goodwin	114	12	102
Debevoise	113	0	113
Elliott	123	16	107
Carter	141	16	135
Woodward	133	18	115
Bibbins	150	35	115
Overbagh	178	45	133
Hunt	175	50	125

The entertainment committee provided an automobile trip throughout Seattle, which greatly impressed the San Francisco contingent with the wonderful strides being made by the northern city. During the session numerous dinner parties were given. Mr. Berry, of the Western Electric Company, entertained at the Hotel Butler; Mr. Fowden fed seven cronies at the College Inn; Mr. Holabird complimented Mr. and Mrs. Carrigan and daughter at the Rathskeller; Mr. Carrigan reciprocated by a dinner to twelve of the jobbers at the Country Club after the golf tournament. The General Electric Company capped the climax by giving a banquet at their headquarters in Machinery Hall of the A.-Y.-P. Exposition, at which all the courses of an elaborate menu were cooked in an electric kitchen. At this dinner, Mr. H. M. Winters presided as host for some thirty guests. The dinner was further enlivened by a flow of oratory from the guests so gifted, and also by songs from a quartet comprised of Messrs. Fobes, Holabird, Hillis and Goodwin. The culinary arrangements were under the supervision of Miss Potts of Schenectady, New York.

TRADE NOTES.

George R. Greenleaf, dealer in gas and electrical fixtures, is now at 2134 University avenue, Berkeley, Cal.

The Kellogg Switchboard & Supply Company of Chicago and the Dean Electric Company of Elyria, Ohio, have been combined as the Kellogg-Dean Electric Company.

On October 1st the Condit Electric Manufacturing Company, of Boston, Mass., became the general sales agents for the Chase-Shawmut Company, of Newburyport, New Jersey.

Mr. J. E. Woodbridge has arrived in San Francisco as local engineer for Ford, Bacon & Davis, to change the substation of the United Railroads of San Francisco, from 25 to 60 cycle, so to be able to use power from the Stanislaus Power Company.

The Harvard Mine of Jamestown, Cal., of which Mr. C. E. Shafer is superintendent, recently placed an order with Fairbanks, Morse & Co., San Francisco, for one 150 h. p., 3 bearing, type "B," 2 phase, 440 volts, 600 r. p. m., induction motor for operating the compressor.

It is reported that an additional generator for the Stanislaus Power Company has been shipped by the General Electric Company. This generator is of the same type as the three which were installed before. Considerable progress has been made on the transmission lines in the way of erecting towers, as the work has been rushed to the utmost.

The Gould Storage Battery Company, through its San Francisco office, has closed a contract with the Alaska Commercial Company for a regulating storage battery to take care of the voltage fluctuation in the elevator service of the Alaska Commercial Building. They also report that the White House will install Gould storage batteries in their new building.

Agutter-Griswold Company of Seattle, Washington, who recently suffered heavy fire loss in the manufacturing department are again fully equipped for business at the old location, 411 Occidental avenue. As a result of the fire considerable more floor space has been obtained which allowed of a complete re-arrangement of machinery so that now the various departments are segregated. The firm will continue to manufacture the complete line of switches, steel cabinets, panel boxes, panel boards and switchboards, as well as their more recently developed Universal metering panels and meter boxes.

NEW CATALOGUES.

The Welsbach Company have issued a handsome catalogue illustrating and describing Reflexoliers, a line of chandeliers and brackets for "Reflex" lamps.

Hot Points for September, 1909, from the Pacific Electric Heating Company of Ontario, Cal., is largely devoted to El Tosto, an electric device for making toast.

Panel Boards and Cabinets, Bulletin No. 4681, recently issued by the General Electric Company, illustrates and lists all of the panel boards designed by this company. This line of boards includes designs selected after careful study of all general requirements. The bulletin will be of service to architects, builders and jobbers in general.

INDUSTRIAL

GEARED FREIGHT LOCOMOTIVE FOR NEW YORK, NEW HAVEN AND HARTFORD RAILROAD.

The Westinghouse Electric and Manufacturing Company has contracted to build for the New York, New Haven and Hartford Railroad, an electric freight locomotive of large capacity, for use on the electrified section between Stamford and New York City. The construction of this machine is well under way and the manufacturers expect to have it ready for service in the month of October.

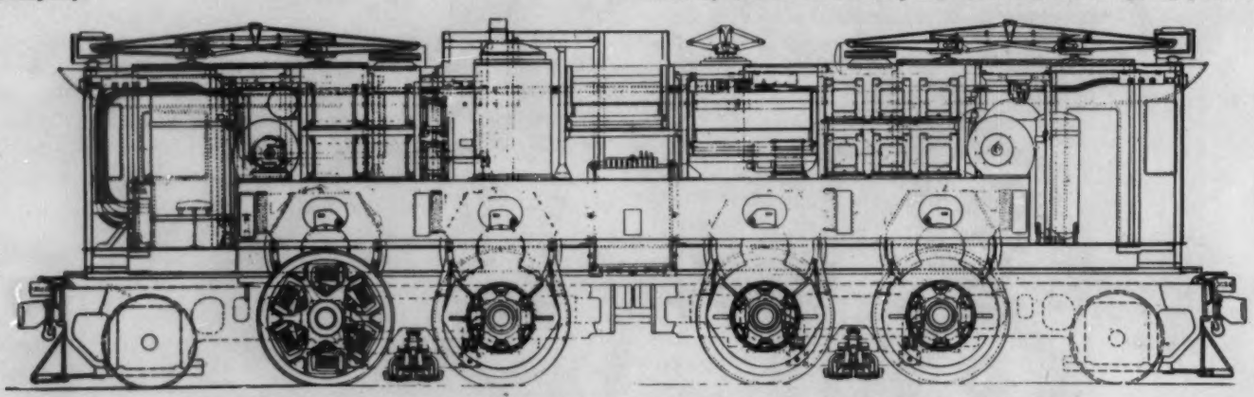
The locomotive has been designed primarily for handling fast freight service, but will also be used for hauling heavy passenger trains. The machine will be placed in regular service by the New Haven road as soon as completed, and given a thorough test in the freight service with a view to eventually handling all this class of work electrically.

The mechanical parts of this locomotive have been designed by the engineers of the Baldwin Locomotive Works and the mechanical department of the N. Y., N. H. & H. R. R., and are being built at the Philadelphia works of the Baldwin Company.

The wheel loads are equalized as in steam locomotive practice, the springs of the leading wheels being connected to the driving springs by equalizing beams. One of the trucks is cross-equalized under the center of the locomotive. The frame is spring-supported by the cross-equalizer, on each side of the center line. This arrangement should promote steady riding, and tends to prevent side-rolling at high speed.

The cab is built of steel plate, and measures 43 feet 6 inches in length, covering the entire locomotive. The frame which supports the cab is composed of two 12-inch channels, united at the ends of plates and angles. This frame is braced transversely by five cast-steel cross-ties; one over each truck center-pin, one at mid-length, and one near each end of the locomotive. The truck center-pins carry no weight and, as before explained, one of them is allowed a fore-and-aft as well as a rotative motion.

The cab is supported on the intermediate and end cross-ties, the weight being transferred through coiled springs which are placed in suitable pockets. The cab frame is held in alignment by the truck center-pins, while the lower spring pockets



Sectional Elevation of Geared Freight Locomotive for the New York, New Haven & Hartford Railroad.

The design includes features of special interest. The general plan of the trucks and running gear has been worked out in accordance with a patent granted to S. M. Vauclain, July 6, 1909. This patent describes an articulated locomotive in which the truck frames are connected by an intermediate draw-bar. One truck has only a rotative motion about its center pin, while the other has a fore-and-aft as well as a rotative motion, in order to compensate for the angular positions of the trucks and draw-bar when the locomotive is traversing curves. The tractive force is transmitted through the truck frames and draw-bar, instead of through the main frame.

In the present instance, the 2-4-4-2 wheel arrangement has been adopted. Each truck has two pairs of driving wheels, and a single pair of leading wheels. The driving wheels are held in alignment by cast-steel bar frames, similar to those usually used in steam locomotive practice. The frames are placed outside the wheels, and are braced transversely under the center of the locomotive by heavy steel castings provided with draw pockets in which the intermediate draw-bar is seated. This bar transmits from one truck frame to the other the full tractive force developed by the motors of the leading truck. Train connections are effected by means of two radial draw-bars, one of which is placed at each end of the locomotive. The draw-bars are pinned to cast-steel cross-ties, which brace the truck frames between the driving and leading wheels. The latter are mounted in radial-swing trucks of the well-known "Rushton" type. The radius bars for these trucks are pivoted to the same cross-ties as the main draw-bars.

are free to slide over the truck-frame cross ties. The springs over the end cross-ties are placed 30 inches apart, transversely. The middle cross-tie carries four springs; these are placed at the corners of a rectangle and are 84 inches apart, transversely, and 53 inches, longitudinally. As both the trucks are free to rotate about their center-pins, the displacement of the spring pockets, even on a 20-degree curve, is comparatively slight.

To assist in reducing shocks and keeping the two truck frames in alignment, chafing castings and spring buffers are interposed between the frames, under the center of the locomotive.

The principal dimensions of this locomotive are as follows:

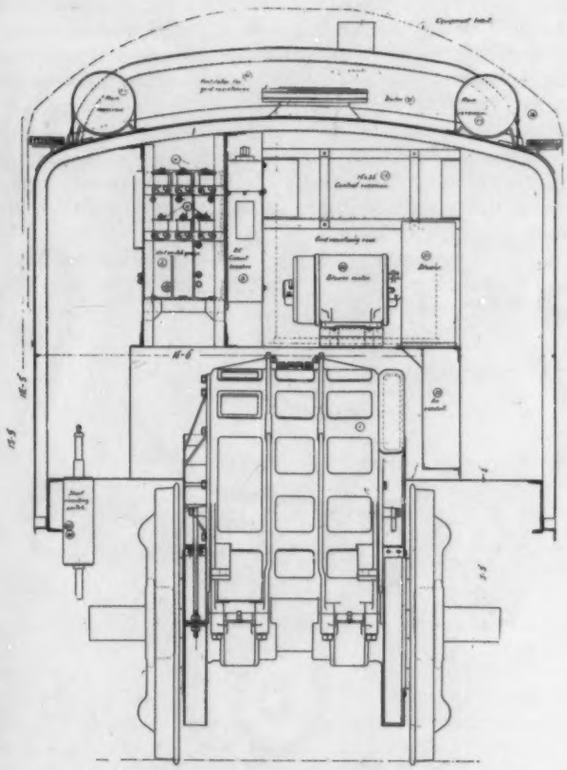
Gauge	4′-8½″
Driving wheels, outside diameter	63″
Driving wheels, center diameter	56″
Driving-axle journals	8″x13″
Truck wheels, diameter	42″
Wheel-base, rigid	7′-0″
Wheel-base, total	38′-6″
Length between coupler faces	48′-0″
Height over all	13′-9″
Width	10′-0″
Approximate weight total	260,000 lbs.
Approximate weight on driving wheels	188,000 lbs.

It is believed, from experience gained with previous locomotives, that the plan of running gear and cab support adopted

for this engine, will tend to avoid nosing, promote easy riding and minimize shocks on the track and road bed.

A characteristic feature of the heavier details is the free use made of cast steel. This is particularly true of the truck frame cross-ties, which are interesting examples of mechanical design. The tendency to follow approved steam locomotive practice is also evident in many of the mechanical details of this locomotive

The electrical equipment, which is being built and mounted by the Westinghouse Electric & Manufacturing Company, comprises four 350-horsepower single-phase geared motors, together with the necessary auxiliary apparatus for their operation from the 11,000-volt alternating-current or 600-volt direct-current circuits of the electrified sections which the locomotive will traverse.



Cross Section Through Geared Freight Locomotive

The motors are placed directly over the axles and are mounted solidly on the truck frames. Each end of the armature shaft is provided with a pinion; these mesh with gears mounted on a quill surrounding the axle and carried in bearings on the motor frame, similar to the usual axle bearings. The quills are provided with six driving arms on each end, which project into spaces provided between the spokes in the driving wheels. Each of these arms is connected to an end of a helical spring, the other ends of the spring being connected to the driving wheels.

This arrangement of drive smooths out the torque pulsations, and at the same time allows for vertical movement of the axles. In addtion to the spring connection between the quills and drives, flexibility is provided between the pinions and motor shaft, to equalize the torque on the gears. The quills are of large diameter, permitting unrestricted motion of the wheels and axles. The center of gravity of the motors, as well as that of the entire locomotive, is high, avoiding the transmission of strains and shocks from the track and roadbed to the motors.

The motors, of standard Westinghouse type, have twelve poles built into a solid frame, and are designed for forced ventilation. When operating on 25-cycle alternating current with forced ventilation, each of the four motors will carry continuously a load of 300 horsepower. An air-blast transformer is provided for lowering the trolley line voltage to that required by the motors. The control apparatus is of the well-known Westinghouse electro-pneumatic type.

When operating on alternating current, all four motors are connected in multiple and the control is obtained entirely by changing the connections to various voltage taps on the main transformer. On direct current the motors are first grouped all in series, and then two in series and two in parallel, in combination with various resistance steps. Provision is made for cutting out any one of the four motors singly on either alternating current or direct current.

A master controller and brake valve are located in each end of the cab so that the locomotive can be operated from either end, and the system of control is such that two or more locomotives of this type can be coupled together and operated from one master controller.

Two pneumatically-operated pantagraph trolleys are provided for collecting current from the 11,000-volt overhead alternating-current line. Pneumatically-operated third-rail shoes are used to collect current on the direct-current third-rail section.

The locomotive will be capable of hauling a freight train having a maximum weight of 1500 tons, at a speed of 35 miles per hour. When used in passenger service, 800-ton trains will be hauled at a maximum speed of 45 miles per hour. A steam heater outfit is provided on the locomotive for heating the cars of the trains when used in passenger service.

A TROUBLEMAN'S FRIEND IS THE TERMINAL WRENCH

This No. 63W Wrench, is especially adapted for use on terminal nuts, receiver, transmitters, and binding posts, etc. There are three different side openings, with dimensions as follows: 3/8 inch, 5/8 inch and 7/16 inch, which will engage either square or hexagonal nuts. One end is bent at an angle of 45 degrees, to allow its use in confined places. Total length 2 13/16 inches.

Klein Terminal Wrench.

Cut shows actual size of wrench. The cost is so small, and the convenience so great, that one of the wrenches should be in every electrician's tool kit.

Otis & Squires, 155 New Montgomery Street, San Francisco, are Pacific Coast Agents for this line.

The General Electric Company's operation in Japan will hereafter be conducted in formal co-operation with the Shibaura Engineering Company of Tokio, a concern owned by the Mitsui interests. The General Electric Company and the Shibaura Company for a considerable time have operated in Japan practically on joint account, although each traded in its own name. This close understanding has now, it is understood, been put in the shape of a formal agreement, and the two companies will openly co-operate in developing the Japanese market for electric machinery, which has been the chief output of the Shibaura Company. Its business has run in excess of $3,000,000 a year, and this, it is expected. will now be considerably enlarged.

HISTORY OF THE TELEPHONE BOOTH.

A little over thirty years ago the telephone was unknown. At first a scientific toy, then an expensive luxury possible only for the well-to-do inhabitants of towns and cities, the telephone has now become a common necessity, to public institutions, to private enterprises and to homes, not only in our cities but in the country as well. Telephone lines now extend to all corners of the globe and serve people of all races.

As a public utility in a town or city the telephone can only be compared to the street car. The many 'phone stations which now dot every city may well be called "The Rapid Transit Stations on the Wire," for at all hotels, depots, many drug stores and grocery stores, there are means such that the wire can be used by the public and made to do the duties of the common carrier and the messenger boy. More than this, at any time and at almost any place it is used as the means of eliminating distance when a personal interview,

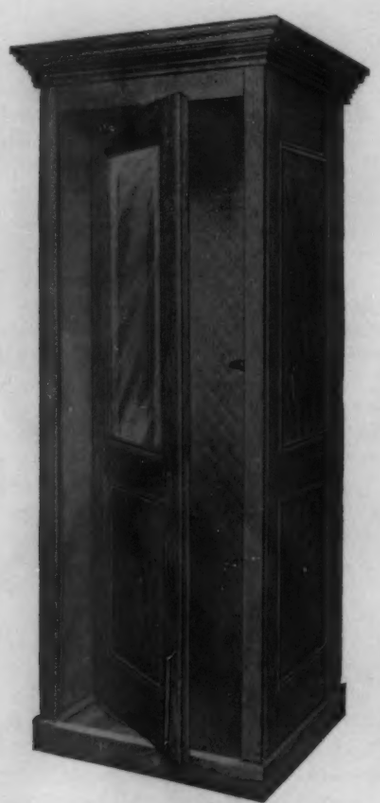


Fig. 1. Special Pay Station Booth

which in many cases would be difficult or impossible, is desired. The telephone in the sound-proof booth has made all this possible and it has established itself so firmly in the business routine of all concerns, large and small, that of all their conveniences they recognize their telephone as the greatest.

When telephones were first installed for public use, at grocery stores and drug stores, they were usually located at some convenient place such as at the end of a counter or at the cashier's desk. At these places any one with the requisite fee was permitted to use the telephone. The popularity of these public stations grew so rapidly and calls became so frequent that it was necessary to set aside a certain section of the store so that the almost continual conversation and loud talking would interfere less with the business. In many cases, however, the stations became such a nuisance that the telephones were ordered out.

Telephone companies in the light of this growing demand for such service could not afford to allow the station to be moved and consequently made concessions such that storekeepers would allow the stations to remain. Telephone manufacturers were not slow in taking in the situation, and the Western Electric Company was among the first to place on the market a sound-proof booth designed especially for deadening the voice. From the first these booths have been a success.

Grocery stores and busy drug stores immediately took advantage of this means of eliminating that feature of the public telephone which to them was a nuisance and positive interrupter of business. They installed booths at their own expense, at first to eliminate the inconveniences of loud talking but later as a purely business proposition. Live business men saw in this popular combination of the telephone and private apartment for talking, a feature which could be used to advantage in their own business. Consequently booths were installed in such a position as to compel those who used the station to pass their display of goods. After a time their books began to show an increase in business, and it became a known fact that the telephone station was the means of securing new and permanent customers. The booth stations seemed to attract the people, and records of toll service began to show a larger number of calls where telephone booths were installed than at those pay stations where there were no booths. At the present time records show that pay stations without booths are very infrequently used when there is a station with a booth located near by.

Today the telephone booth has not only an application for the local and long-distance public pay station, but has made its way into private corporations, hotels, clubs, banks, etc.

Fig. 2. Type of Booth for Shops and Mining Quarters

It has proven itself not only a convenience but a necessity, in machine shops, printing houses, mills, mines and other places where noise of machinery, shuffle of feet or clamor of voices make telephoning either impossible or very difficult.

In many of the offices of large business houses it is used to complete their system of codes and cyphers and to insure privacy to all telephone communications. It is further used to enable telephone conversation to be carried on without interruption by parties talking and also to prevent any disturbance by a necessarily loud 'phone conversation.

The construction of telephone booths has had considerable attention and they are now built suitable for every condition of service. They are seen in almost every conceivable place large enough for a person to stand, such as under stairs, in corners and other places where space is least valuable. The booths have come of necessity and are designed for attractiveness, convenience, comfort and service. The Western Electric Company, now the largest manufacturers of telephones and telephone supplies in the world, are manufacturing

several types in different sizes furnished with special designs to match interior decorations and finishes. They are made from carefully selected, thoroughly seasoned and kiln dried timber and finished in the best possible manner, with all equipment and other conveniences of the style desired. All these booths are so constructed that it does not require mechanical skill to install them. They are shipped, knocked down and arranged in such a way that in a few minutes with a well directed hammer and screw-driver they may be set and ready for use. The illustrations show the types of booth which are being manufactured and supplied in large numbers for offices and pay stations.

Fig. 3. Type of Booth for Stores and Offices.

Fig. 1 illustrates a "special" booth which is standard with the New York Telephone Company and used exclusively by them for their pay stations. It is very compact and the receding door admits of its use in spaces where booths of the same size with swinging doors could not be installed. This booth is very simple in construction and easily installed. It embodies the latest and most reliable features of booth design and shows how serviceable and convenient the telephone booth may be made.

Fig. 2 illustrates a type of booth designed for use in shops and mining quarters. These booths have all the noise-proof qualities of the more expensive booths and are so constructed as to provide lasting and satisfactory service.

Fig. 3 illustrates modern booths which are very attractive and popular for office use. The large windows afford ample natural light and their size assures comfortable service without sacrificing the useful floor space of a busy office.

Census Director E. Dana Durand announces November 3 next as the data for making a practical test of the qualifications of applicants for appointment as special agents for the collection of the thirteenth census statistics of manufactures and mines and quarries. Blank applications may be obtained now by writing the Bureau of the Census. No applications which are received after the close of business, October 25, will be considered. In a circular of instructions relative to the subject the Director states that about January 1, 1910, the Bureau will employ from 1,600 to 1,800 special agents. As far as possible it is desired to obtain for this work persons who have had college or university courses in statistics or economics, and persons who have had service in the accounting department of some manufacturing or other business establishment.

THE STUDEBAKER ELECTRIC PLEASURE VEHICLE.

Speaking of one phase of the electric pleasure vehicle, which is often discussed, Manager John T. Eagal of the automobile department of the Studebaker Bros. Co., said a few days ago:

"Those central stations who still retain some of the earlier prejudices against the electric pleasure vehicle and have not yet sensed the public's interest in them and the immense increase which their general use means to the sale of 'juice,' have been skeptical as to the economy of these vehicles.

"We have frequently received inquiries for definite statements as to the cost of operation, based on an itemized account covering a considerable period. One of the most complete records, we know of, is in the reproduction of the report of the performance of a Studebaker electric demonstrator, equipped with 'Exide' batteries (our standard), in Boston for six months ending September 30th, and is well worth careful scrutiny in this connection. It was not prepared for publication or advertising, but for Studebaker's own instructions, but it is in no way inconsistent with less accurate records of many thousands of electric pleasure vehicles now in use in various parts of the country.

"There are many cases right here in California where the cost of maintenance of electric pleasure vehicles in private use is materially less than estimated especially when charged from a rectifier.

"The Studebaker organization having been for fifty-two years in the business of producing and distributing annually 125,000 vehicles from the largest plant in the world, offers to those considering the use of electric machines whether for pleasure or mercantile uses, the greatest possible use for permanent satisfactory business transactions. Every one of our branch houses has available an organization which practically monopolizes those which have made a minute study for any considerable length of time of the transportation of passengers and merchandise by electric vehicles.

"This corps of experts is available to assist the customer in every reasonable manner. It would be the limit of shortsightedness to sacrifice the future of the business for any other consideration.

"Such facilities for obtaining reliable information and practically analyzing it are guarantee enough that these engineers will not be led into will-o-the-wisp catch words of the man of the street to the total loss of the real point, namely, the customers' economy.

"The report to which I refer is gotten up in convincing style and is so simple that it may be understood and appreciated by anyone. We have already mailed thousands of these reports to all parts of the State and the results have been most gratifying. We still have a few copies of the report left which we will mail upon request."

A. Haase, patternmaker, San Francisco, has moved to larger quarters at 256 Freemont street.

Richard Froboese, mechanical engineer, San Francisco, has associated himself with the Western Steel Works, and will spend part of his time with this new enterprise as their manager.

On September 22 the auditor of the City of San Francisco was notified that a suit had been brought to set aside the contract entered into by and between the Board of Public Works and the Byron Jackson Iron Works for the construction of the pumps for the fire boats and auxiliary salt water supply system and warned not to pay the $34,000 at present due on the work. T. A. Allen brought the suit, represented by Page, McCutchen & McCutchen.

NEWS NOTES

FINANCIAL.

COLUSA, CAL.—Bids for the purchase of $50,000 bonds for construction of a water system will be received until October 18th by the Town Trustees.

TOPPENISH, WASH.—An election will be held October 5 for the purpose of voting on the issuing of bonds for $24,500 for the purpose of installing a water and sewer system.

BRAWLEY, CAL.—The City Trustees will call a bond election to vote on the proposition of issuing and selling bonds in the sum of $60,000 to provide sewers, fire protection and water system.

NOLTVILLE, CAL.—The electors of the city will hold an election on October 15th for the purpose of issuing and selling bonds in the sum of $37,000 for purchasing or constructing a water works system. The bonds will be $1000 each and 37 in number.

OREGON CITY, ORE.—A mortgage has been filed by the Portland Water, Power and Electric Transmission Company, of which F. S. Morris of Portland is the head, to the Girard Trust Company of Philadelphia to secure the payment of a $1,500,000 bond issue.

SONORA, CAL.—An ordinance is being drafted by the City Trustees in the matter of issuing bonds for water improvements. Both the proposition of buying the Gold Mountain Water Company's property, and of a high pressure water supply will be submitted to the voters.

PORTLAND, ORE.—Control of the United Railways Company and the Ruth Trust Company has been secured by J. H. Hurlbert of Fontenelle, Ia., and C. T. Dunbar of Vancouver, B. C., who have purchased the five-ninth interest in both concerns held by Moritz Thomsen and W. D. Hofius of Seattle and T. I. Greenough of Missoula. The purchasers have already closed negotiations for the other four-ninths of the stock with the Portland holders. The purchase price was between $2,500,000 and $5,000,000.

SAN FRANCISCO, CAL.—The balance of the $600,000 issue of water-supply bonds will be offered for sale to the highest bidder on October 25. A resolution authorizing the sale will be introduced at the next meeting of the Supervisors, and as soon as the necessary formalities are completed the bonds will be placed on the market. Already the city has sold $240,000 of the issue at a premium, which materially reduces the interest. There still remains $360,000, which, it is expected, will bring as high a premium as the others.

INCORPORATIONS.

WASHOUGAL, WASH.—Western Light & Power Company of Washougal, $50,000, by C. W., L. E. and G. W. Cottrell.

SPOKANE, WASH.—The Idaho Central Railway of Spokane has been incorporated for $25,000 by A. Morgan and J. A. Rea.

MANSFIELD, WASH.—The Mansfield Water & Light Company, capital $5,000, has been incorporated by J. W. Wright, et al.

TACOMA, WASH.—The Milton Light & Water Company has been incorporated with a capital of $10,000 by O. E. Darling and R. W. Culver.

MARSHFIELD, ORE.—Coos Bay Electric Railway Company, of Marshfield, $150,000, by J. H. Flanagan, C. F. McColl and W. S. Chandler.

SAN FRANCISCO, CAL.—Westside Power Company, capital stock $25,000, by Geo. Pollock, E. A. Clausen and G. S. Barkley, place of business, San Francisco.

SEATTLE, WASH.—The Hydro Electric Construction Company has been incorporated by W. A. Insinger, J. A. Bennett, Frank McKean, with a capital of $200,000.

SPOKANE, WASH.—The Kettle River Water Power Company has been incorporated by E. L. Tate, R. L. Thompson, Reese Voorhees, Charles Grant and W. W. McCreary, with a capital stock of $500,000.

TRANSMISSION.

PORTLAND, ORE.—The Gibson Manufacturing Company will develop power and build a plant on the Clackamas river.

SAN FRANCISCO, CAL.—It is reported that the Stanislaus Power Company will be in San Francisco with their line by the early part of next year.

AGUASCALIENTES, MEX.—While here Norman Rowe, manager in Mexico for the Cuanajuato Power & Electric Company, stated that his company will probably extend its power line into this city.

LOS ANGELES, CAL.—The Pacific Electrical Works of Los Angeles, the Sterling Electric Company of San Francisco, and the Crescent Electric Company of Oakland have consolilated under the name of the Pacific States Electric Company.

SACRAMENTO, CAL.—The Great Western Power Company has filed with the County Recorder deeds for a right of way across the property of C. L. Pugh, L. F. Breuner, the East Lawn Investment Company, and the Showler Estate Company.

VANCOUVER, B. C.—The Burrard Power Company has received from the Dominion Government a grant of 25,000 miners' inches of water on the Lillooet River. This is said to be practically the entire output of the Lillooet lakes at low water stage.

JACKSON, CAL.—Notice of the location of a reservoir site to cover 800 acres of land and of ditch rights to and from it, together with claims to 20,000 inches of the waters of Mokelumne River, have been filed for record here by the General Electric Power Company of California.

VICTORIA, B. C.—Work has been commenced on a hydro-electric development on Gorden River, Vancouver Island, thirty-five miles from Victoria, for an additional supply of electric power for the British Electric Railway Company. Sanderson & Porter, San Francisco, are the engineers and contractors.

OGDEN CITY, UTAH.—The board of directors of the Davis & Weber Counties Canal Company have decided in favor of expending $550,000 in concreting the company's canal, raising the reservoir in East Canyon 30 feet, and in building a power plant at the Ritter farm, five miles south of Ogden, where 5000 horsepower will be generated.

MODESTO, CAL.—C. H. Noak, the superintendent of construction for the LaGrange Light & Power Company, is here from Visalia and will take charge of the company's work of equipping the city with light and power lines. Owing to the delay in obtaining material the work of wiring the city has not progressed as rapidly as was expected. Mr. Noak states that it is his intention to have Modesto supplied with light and power not later than November 1st.

OREGON CITY, ORE.—In addition to the station which the Portland Railway, Light & Power Company has at Cazadero, the Southern Pacific Company will develop water power 15 miles farther up. A power station will be constructed there and nine miles farther a dam will be built, and a race made down to the plant, which will supply 50,000 horsepower, with a possibility of 150,000.

EUGENE, ORE.—The Northwest Corporation is the name to be used in designating the numerous subsidiary organizations of which the Willamette Valley Company, A. Welch, manager, is chief. The proposed developments include develement of water power on the Des Chutes river, a street railway system connecting Walla Walla and Milton, water development in the vicinity of Pendleton and other cities.

FRESNO, CAL.—Wm. S. Douglas and C. M. Russell have filed notice of the appropriation of 15,000 cubic feet of water from Fish Creek to carry the water by tunnel for 2 1-3 miles from a diversion dam to the junction of the Great Bluffs with the middle fork of the San Joaquin River for power purposes; also for a dam and reservoir site 150 feet high and 900 feet long to form a storage reservoir of about 200 acres, the water to flow to Fish Creek in connection with the water rights there.

TELEPHONE AND TELEGRAPH.

DILLON, MONT.—Bids are wanted by the Southern Montana Telephone Company for hauling and setting poles on the line between Dillon and Hill Point.

TWISP, WASH.—The West Side Telephone Company, will be incorporated for $5000. The company proposes to build various lines in this vicinity.

WALLACE, IDA.—Supervisor Elers Koch of the Lolo National Forest has started a crew of men on the work of constructing a number of telephone lines in the reserve.

THE DALLES, ORE.—The Pacific Telephone & Telegraph Company has appropriated $12,000 to cover the cost of removing its telegraph poles from Second street to the alleys.

BELLINGHAM, WASH.—Between $10,000 and $15,000 will be expended at once by the Home Telephone Company of Puget Sound in betterments and improvements in this city.

COLFAX, WASH.—The Pacific States Telephone & Telegraph Company is endeavoring to secure new quarters and will put in a switchboard. The local system will also be overhauled.

VALDEZ, ALASKA.—The Valdez-Fairbanks Long Distance Telephone Company has been formed for the building of a line from this place into the interior with its ultimate destination at Fairbanks.

PORTERVILLE, CAL.—About $5000 is to be spent by the Pacific States Telephone & Telegraph Company in stringing new lead cables and in the installation on the present board of a number of additional temporary Jackson signals. Within a short time after these installations are made, a new and much more commodious switchboard is to be installed in the central office.

ILLUMINATION.

BELLINGHAM, WASH.—Cluster lights will be installed along four blocks of Elk street. The cost will be about $3000.

SAN DIEGO, CAL.—At the next meeting of the City Council an ordinance will be passed calling for bids on street lighting.

HELENA, MONT.—Bids will be received by the city clerk up to October 18 for furnishing f. o. b. this place, electric light poles, wire, etc.

CHEHALIS, WASH.—The Rural Telephone Company was given a franchise for building lines along various roads in the county.

DINUBA, CAL.—G. T. Thompson of Los Angles has been here for several days looking into the proposition of starting a gas works in Dinuba.

PORTLAND, ORE.—The City Executive Board has granted petitions of the residents in the Mount Scott District for the lighting of twenty stations and crossings.

VANCOUVER, WASH.—Plans are being drawn by Architects Berndt & Tegan, Portland, Ore., for a steam plant to generate electricity and furnish heat for the new St. Joseph's Hospital, the Sisters' Academy and the old hospital.

SAN BERNARDINO, CAL.—Application has been made to the Board of Supervisors for a franchise for light and power by the Southern California Edison Company. Sealed bids will be received up to November 2d for this franchise.

EUREKA, CAL.—A contract has been awarded to the Eureka Electrical & Construction Company by the Little River Redwood Lumber Company, for the installation of an electric lighting plant at the company's plant at Little River.

INGLEWOOD, CAL.—A number of citizens have made a proposition to the Board of Trade to furnish residents with gas. It is expected that a meeting will be called shortly by the Board to consider the proposition. A company is to be formed with a capital of $50,000, the greater part of which will be expended for mains and equipment.

TRANSPORTATION.

POMONA, CAL.—A project is on foot to build an electric line from Pomona to Claremont, thence to Indian Hill, a distance of about five miles.

BELLINGHAM, WASH.—Work has been started on the extension of the Whatcom County Railway & Light Company into Happy Valley, a little over a mile in length.

VERNON, B. C.—Plans are under way by the Couteau Power Company for the construction of an electric railway eastward from this place through a rich fruit-growing section.

ABERDEEN, WASH.—J. D. Crary, general manager of the Grays Harbor Railway & Light Company, announces that an interurban line from Grays Harbor to Puget Sound is to be started soon.

BILLINGS, MONT.—A. D. Bowen of Kansas City is negotiating with local capitalists for the building of an electric line between this place and Laurel. The road will be 19 miles in length and cost about $350,000.

NEW WESTMINSTER, B. C.—The Nelson Street Railway Company has been incorporated with a capital stock of $50,000. It proposes to acquire from the city the present tramway and appliances and extend the same.

SPOKANE, WASH.—The Spokane & Inland Railway is planning to double track its Greenacres line, increase the power plant 10,000 horsepower, build 40 miles of high tension line and to purchase additional freight and passenger locomotives.

BELLINGHAM, WASH.—It is announced that R. T. Laffin, district manager for Stone & Webster on Puget Sound, will recommend to the board of directors of the Boston Company that the Bellingham & Skagit County electric line be constructed at once.

CLAREMONT, CAL.—The City Council has passed an ordinance granting to the Ontario and San Antonio Heights Railway Company a right to construct and for a period of 50 years to operate an electric railroad upon certain streets in the city of Claremont.

LONG BEACH, CAL.—The City Council has granted the Pacific Electric Railway Company right to cross city park property from East Ocean avenue to the Oxford property, which the railway company has acquired for the purpose of installing a three-story station.

MARSHFIELD, ORE.—The proposition of the proposed Coos Bay & Inland Electric Railway is now being considered by the commercial bodies of this place, Coquille and Myrtle Point. J. W. Snover and Judge C. A. Schelbrede of this place are connected with the matter.

PORTLAND, ORE.—Property owners along Sixth street are arranging for the illumination of that thoroughfare by the installation of cluster lights, ten clusters to a block, from Jefferson street to the Union Depot. The electric and the gas companies are competing for the contract.

BAKER CITY, ORE.—The Grande Ronde Electric Company of this city has been sold to the Eastern Oregon Light & Power Company, with headquarters in this city. This transaction involves $250,000, and it is said means the connection of this place, La Grande and Walla Walla by electric railways.

RIVERSIDE, CAL.—At a conference held between Superintendent W. W. Poole of the Southern California Cement Company and a party of engineers and track superintendents at Crestmore, definite arrangements were made for extending the new line now in operation between Riverside and Crestmore.

VANCOUVER, WASH.—The Tum Tum Mountain Railway Company has been incorporated for the purpose of building an electric railway from Tum Tum Mountain through Chelatchie Prairie, Amboy and La Center to Ridgefield, E. M. Meach is president; P. O. Hillstrom, treasurer, and F. R. Whelan, secretary.

PALO ALTO, CAL.—The Peninsula Electric Railroad has its agents at work securing a right of way for an extension of its local electric lines. The plan is to continue the road from the end of the University avenue line through the Hopkins holding, along Ashby avenue, through Boyce Addition to Channing lane.

NEWPORT, WASH.—The Panhandle Electric Railway Company, organized to build a railway from Priest River, Idaho, to Priest Lake, has secured practically all the right of way to be secured from ranchers and will take up at once the matter of right of way through the Kaniksu National forest, over which Supervisor Miller has jurisdiction.

SAN FRANCISCO, CAL.—At the annual meeting of the Northern Electric Railway Company the following directors were elected: E. R. Lilienthal, Leon Sloss, W. P. Hammond, E. J. de Sabla, Chas. Butters, Joseph Sloss and A. E. Boynton. The officials are: E. R. Lilienthal, president; Leon Sloss, vice-president; E. J. de Sabla, vice-president; Norman Logan, secretary-treasurer, and Geo. E. Springer, assistant secretary.

WATER WORKS

MARYSVILLE, CAL.—Surveyors are at work for the Marysville Water Company, setting stakes for the extension of the water mains.

WENATCHEE, WASH.—Engineer W. R. Powell will install a pumping plant this fall on the L. M. McLean tract five miles below Chelan Falls.

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Water Commissioners for approximately 1200 feet of riveted sheet steel pipe.

SANTA MONICA, CAL.—Extensions of salt water fire mains of Venice and Ocean Park, as far as Ashland avenue, in this city are being considered by the council.

COLUSA, CAL.—Sealed bids will be received by the Board of Trustees up to October 25, 1909, for furnishing material for and the construction and completion of a waterworks and water system for the town of Colusa.

LONG BEACH, CAL.—The Long Beach Water Company has agreed to move its pipe lines from Elm avenue, if property owners will extend laterals to the end of their lots, making it possible to connect with the main line.

PALO ALTO, CAL.—The Board of Works has awarded contracts as follows: Crane Co., 8,632 feet of 4-inch pipe at $35.75 a ton; 172 feet of 6-inch and 8-inch pipe at $34.75 a ton; 6,500 pounds of lead at $5.06 per hundred pounds.

PORTLAND, ORE.—Sealed bids are being received for the laying of water mains in the following streets: East Thirtieth street, Holladay avenue, Grand avenue, Front street, Nineteenth street, Carter street, Seventh street, Twelfth street, Fourteenth street, and a number of other streets.

NEW WESTMINSTER, B. C.—The municipality of Burnaby, adjoining New Westminster, is considering installing a $500,000 water system. It is planned for the municipalities of Burnaby, Point Gray and South Vancouver to bring the water from one source in a single main, to be subdivided for the different districts.

OCTOBER MEETINGS OF A. S. M. E.

Meetings of The American Society of Mechanical Engineers are to be held during the month of October as follows: In New York, on Tuesday evening, October 12, at 8 o'clock, in the Engineering Societies Building, with a paper by Prof. R. C. Carpenter of Cornell University upon The High-Pressure Fire System of New York City. In St. Louis, jointly with the Engineers Club of St. Louis on Saturday evening, October 16, when Prof. Carpenter will again present his paper upon the high-pressure fire system. In Boston, on Wednesday evening, October 20, at 8 o'clock, jointly with the Boston Society of Civil Engineers in Chipman Hall, a paper will be presented by Prof. Gaetano Lanza and Lawrence S. Smith on Comparison of Results Obtained by the Use of Three Theories of the Distribution of the Stresses in Reinforced Concrete Beams," with the experimental results.

In conducting meetings in St. Louis and Boston the Society is entering into broader activities than ever before and affording the membership a greater opportunity to attend meetings, participate in the discussion of papers and meet members and engineers in attendance at the meetings. The meetings in St. Louis and Boston as well as in New York are to be regular meetings of the Society, with the same standards maintained in regard to papers, discussion and general conduct of the meetings that have been established by the conventions and other regular meetings of the Society held in previous years.

Of the two papers to be given in October, that by Prof. Carpenter gives a technical description of the high-pressure fire system of New York City and the results of tests made upon the pumps and distributing mains. The first high-pressure fire system in the country was installed at Detroit in 1888, where it was designed to fill the mains by means of steam-driven pumps on boats. There are now systems installed or in process of construction in Philadelphia, Brooklyn, Baltimore, Boston, Buffalo, San Francisco, Toronto and possibly other places. In some of the installations multi-stage centrifugal pumps are employed and in others plunger pumps are used. There is therefore an opportunity for discussion of high-pressure systems, as such, and also of the relative advantages and characteristics of different types of pumps for high-pressure work.

The paper by Professor Lanza and Mr. Smith gives the results of extended experiments upon full-sized reinforced concrete beams with well-developed theories, forming an important contribution to the all-important subject of rein forced concrete construction.